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Nairobi work programme on impacts, vulnerability and adaptation to climate change

Good practices and lessons learned in adaptation planning processes addressing ecosystems, human settlements, water resources and health, and in processes and structures for linking national and local adaptation planning: a synthesis of case studies

Note by the secretariat*

Summary

This document synthesizes the information contained in 170 case studies contributed by Parties and partner organizations of the Nairobi work programme on impacts, vulnerability and adaptation to climate change on: (1) available and implemented tools and methods for adaptation planning processes addressing ecosystems, human settlements, water resources and health; (2) good practices and lessons learned in relation to adaptation planning processes, including monitoring and evaluation, for the four thematic areas addressed; and (3) good practices and lessons learned in relation to processes and structures for linking national and local adaptation planning. In addition, the document identifies possible next steps to be taken in the light of the challenges and gaps that emerged from the case studies.

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* This document was submitted after the due date owing to the time required to coordinate inputs from the large number of experts and partners who contributed to the case studies and/or this synthesis document.

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I. Summary

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its fortieth session, requested the secretariat, under the guidance of the Chair of the SBSTA, in collaboration with the Adaptation Committee and the Least Developed Countries Expert Group, and with contributions from relevant partner organizations of the Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP), including regional centres and networks, to develop case studies, as appropriate, that highlight the following, for consideration at SBSTA 43:[1]

(a) Available and implemented tools and methods for adaptation planning processes addressing the four issues of ecosystems, human settlements, water resources and health;

(b) Good practices and lessons learned in relation to adaptation planning processes, including on monitoring and evaluation, addressing the four issues mentioned above;

(c) Good practices and lessons learned, related to processes and structures for linking national and local adaptation planning.

B. Background

2. The Conference of the Parties (COP), at its nineteenth session, decided to continue the NWP within the framework of the provisions of decision 2/CP.11, addressing the knowledge needs arising from the Cancun Adaptation Framework and other relevant workstreams and bodies under the Convention and the knowledge needs identified by Parties.[2] The COP also requested the SBSTA to consider, under the NWP, the thematic areas of ecosystems, human settlements, water resources and health.[3]

3. In accordance with decision 17/CP.19, SBSTA 40 agreed on a set of activities to be carried out under the NWP by 2015 so that information and knowledge may be collected, analysed and disseminated to inform adaptation planning and actions at the regional, national and local levels in relation to, inter alia, ecosystems, human settlements, water resources and health.[4]

C. Scope of the note

4. This document is a synthesis of 170 case studies[5] contributed by Parties and NWP partner organizations, including regional centres and networks. Thematic experts from

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[1] FCCC/SBSTA/2014/2, paragraphs 20 and 24.

[2] Decision 17/CP.19, paragraph 1.

[3] Decision 17/CP.19, paragraph 5.

[4] FCCC/SBSTA/2014/2, paragraph 19.

[5] Submitted to the secretariat as at 18 June 2015.

NWP partner organizations helped in the review of this document to ensure that it is factually faithful to the original case studies.[6]

5. Chapter I.D below provides an overview of the case studies, including their distribution by thematic area and region. Chapter I.E–H provides a synthesis of the information contained in the case studies, with each chapter addressing one thematic area (ecosystems, human settlements, water resources and health, respectively). Each of these subchapters presents an overview of the thematic area, the tools and methods used in the adaptation planning processes, and the good practices and lessons learned.[7, 8] Chapter I.I provides a synthesis of good practices for monitoring and evaluation (M&E) in all four thematic areas referred to in paragraph 2 above. Chapter I.J analyses the case studies that focus on processes and structures for linking national and local adaptation planning. Chapter I.K concludes the summary of the document with possible next steps. It also provides information that would be useful for adaptation practitioners and policymakers in the light of the gaps and challenges identified.

D. Overview of the case studies

6. A total of 170 case studies were contributed by Parties and NWP partner organizations in line with the mandate outlined in paragraph 1 above and in response to the invitation issued by the secretariat. The case studies comprise 47 submitted by 21 Parties and 123 submitted by 43 NWP partner organizations. Of the 170 case studies, 153 focus on the thematic areas referred to in paragraph 2 above and 17 focus on processes and structures for linking national and local adaptation planning.

7. While most of the 153 thematic case studies address more than one theme, one primary thematic area was identified for each case study for the purpose of the analysis. Recognizing that most case studies addressed more than one theme, these secondary themes are illustrated in figure 1 below, which shows the distribution of the primary and secondary themes of these case studies.

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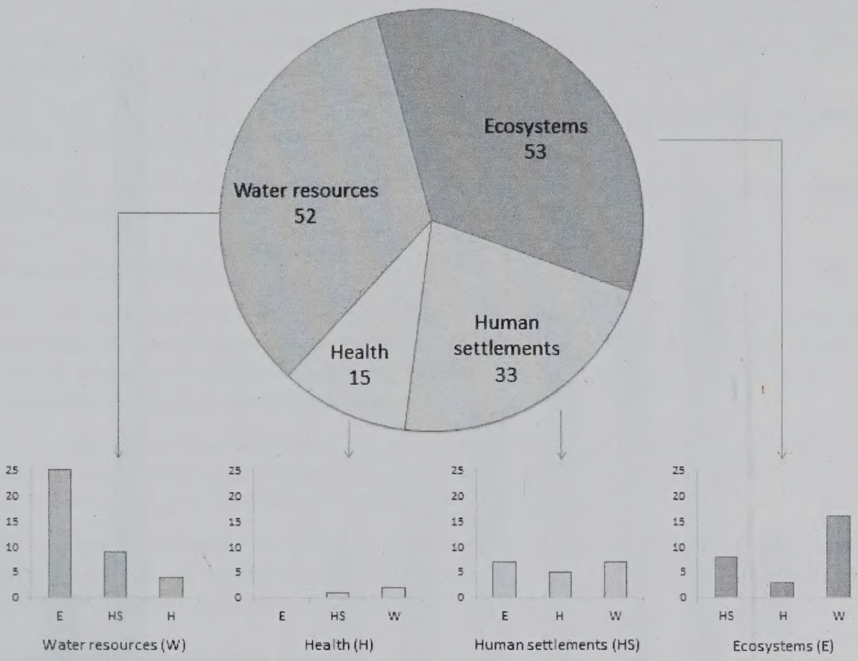
[6] Experts from the Alliance for Global Water Adaptation, the Global Water Partnership, the International Union for Conservation of Nature, the Stockholm International Water Institute, the United Nations Human Settlements Programme, the United Nations Environment Programme, the World Conservation Monitoring Centre and the World Health Organization reviewed a draft version of this document.

[7] In the synthesis, good practices include but are not limited to processes and structures that: (1) are particularly conducive to stakeholder engagement; (2) consider traditional, indigenous and local knowledge; (3) include monitoring and evaluation to inform iterative adaptation planning; and (4) are concrete examples from the case studies submitted. Lessons learned highlight and summarize factors that influence success as well as challenges, without explicit reference to any examples; rather, they are based on the overall assessment of the case studies under each thematic area.

[8] Please note that although not all case studies listed in annex I are referred to in this document, relevant information from all the case studies has been taken into account to compile good practices and lessons learned. Where practical, examples from a selection of case studies are used to illustrate good practices.

Figure 1
Distribution of case studies by thematic area



Notes: (1) Only the 153 case studies identified as thematic are included in the figure; (2) The pie chart shows the primary thematic area addressed (with the number of case studies shown under the themes) and the bar charts show the secondary thematic areas addressed for each primary theme (with the number of case studies shown on the y-axis).

8. The 17 case studies focusing on processes and structures for linking national and local adaptation planning also addressed water resources (12), human settlements (11), ecosystems (10) and health (9). Of the total of 170 case studies, 127 provided information on ongoing adaptation planning and 43 provided information on completed actions.

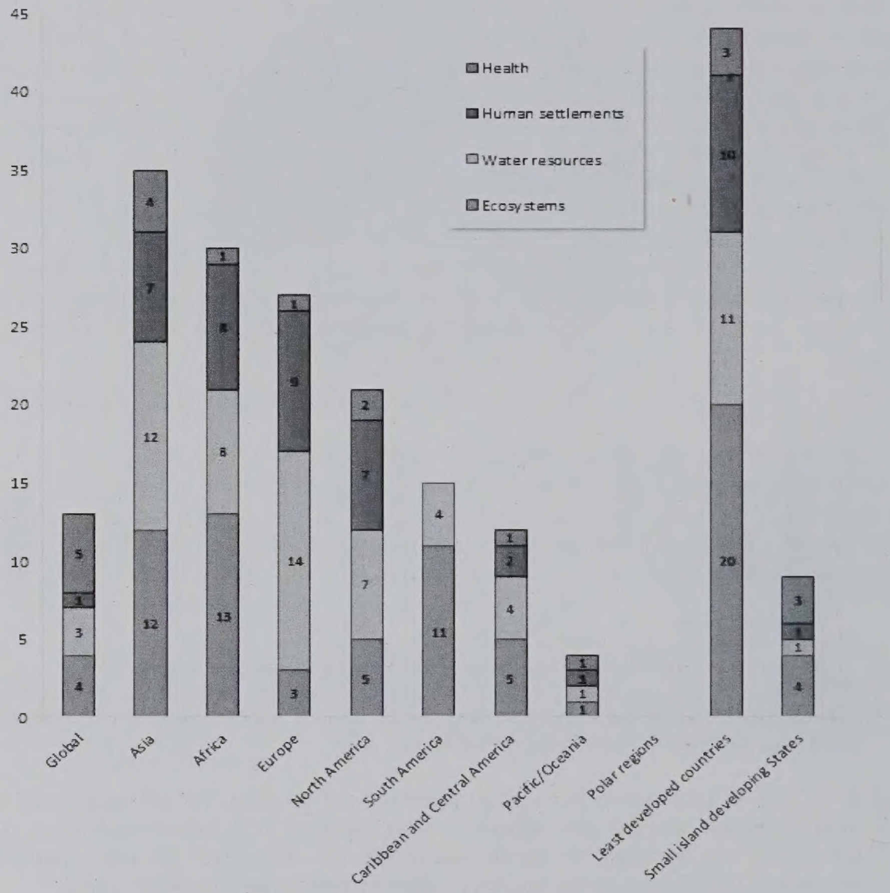
9. Consideration of indigenous and traditional knowledge was identified in 33 case studies. Gender-sensitive approaches and/or different roles for men and women were discussed in 36 case studies. Information on M&E was included in 116 case studies.

10. The majority of the case studies focus on Asia and Africa. Figure 2 shows the regional distribution of the case studies.

Figure 2

Distribution of case studies by region and other groupings

(Number of case studies)



11. Each case study was assigned a code (see annex I for the code, title and other information on each case study, and annex II for the tools and methods associated with each case study; both annexes are organized by thematic area). Throughout this document, where appropriate, case studies are referred to by these codes (which are provided mostly in footnotes).

E. Synthesis of information addressing ecosystems

1. Overview

12. The case studies addressing ecosystems highlighted that climate change affects ecosystems, their functions and the many benefits and services that they provide to society. The case studies recognized that ecosystems are complex and are interconnected; that they evolve and change over time; and that one of the major drivers of long-term ecosystem change is climate change. Therefore, the case studies indicated that adaptation processes addressing ecosystems need to occur at appropriate spatial and temporal scales.

13. The case studies presented adaptation activities that address a range of climate-related hazards, including:

(a) Drought (36), related to increased summer aridity leading to decreased water availability, decreased rangeland productivity and increased risk of fires in forests, drylands, croplands and grasslands;

(b) Flood (27), which in turn results in an increase in landslides, and glacial retreat in mountain ecosystems and inland waters;

(c) Shift of seasons (24), related to change in marine systems as a result of large-scale climate shifts.

2. Tools and methods

14. Various tools and methods have been developed for and applied to adaptation planning processes addressing ecosystems. Tools and methods have been developed to identify and appraise adaptation options, and frameworks, tools and indicators have been developed for M&E of adaptation actions.

15. The case studies underlined that a conceptual separation between ecosystem-based adaptation and adaptation of ecosystems is needed, while recognizing the broader role that ecosystems could play in actions to combat climate change.

16. Ecosystem-based approaches for adaptation have been widely applied to improve ecosystem resilience and to maintain and enhance the quality and quantity of ecosystem services so that they can support societal adaptation to climate change.

3. Good practices and lessons learned

17. The case studies identified good practices for implementing ecosystem and adaptation projects. A selection of which is highlighted below:

(a) Participatory decision-making that is decentralized to the lowest accountable level and is iterative, inclusive and adaptive is critical. Interactive and shared learning and participatory decision-making help build local ownership. In all such examples, the common denominator was to build trust and credibility through coordinated and participative actions with key stakeholders. Building and instilling local institutional capacity could involve strengthening existing social, technical and political actors, institutions and decision-making bodies through targeted training and peer-to-peer learning. The inclusion of women and of poor, vulnerable and marginalized communities in adaptation planning has proven effective given their direct dependence on ecosystems for their livelihoods;

(b) Information and knowledge from all sources, including co-construction of knowledge from traditional, local and contemporary scientific sources, should be used to ensure that cultural and gender sensitivities are addressed and robust information is gathered and validated. Supporting the application of local knowledge can be helpful in identifying economically and socially viable solutions (e.g. locally appropriate solutions) to build the resilience of natural and societal systems;

(c) Involvement of both government and non-government stakeholders is key to ensuring effective adaptation planning processes;

(d) Integration and inclusion of adaptation initiatives in existing development plans and sectoral strategies can help secure financing, achieve alignment between plans and strategies that may otherwise negatively impact on adaptation initiatives, and facilitate effective coordination among key stakeholders and implementation of adaptation actions;

(e) Economic and livelihood diversification serves to enhance the resilience of people. Such diversification might also help address the resilience of ecosystems through reducing drivers of degradation;

(f) Provision of financial resources does not guarantee successful implementation of adaptation actions unless it is coupled with effective institutional set-up, sustainable financial schemes and non-financial services such as education programmes. The bundling of non-financial services could play a critical role in the success of any financial scheme.

18. A range of factors that influence success emerged from the case studies. These factors include: active participation of stakeholders, which helps build trust, ownership and support for adaptation planning processes; integration of indigenous and scientific knowledge and co-design of adaptation measures, which empowers local communities; high-level coordination across key sectors, which is particularly helpful for policy integration and leveraging financing for adaptation actions; transboundary cooperation, which facilitates access to climate data and information; adaptation options that are flexible and responsive to capacity and political structure at all levels; and consideration of non-climate drivers of change and the underlying determinants of vulnerability.

19. The case studies also reported a number of challenges. These include: maintaining the high level of time commitment of relevant stakeholders which, as demonstrated by some case studies, could be addressed through thorough, flexible and inclusive engagement approaches; having limited access to downscaled climate data for risk and vulnerability assessment, which could be overcome by applying a phased approach to risk assessment; and determining how to measure, attribute, put a time frame on (where impacts may take a long time to detect), cost, identify impacts, build an evidence base and undertake M&E to determine the effectiveness and efficiency of adaptation approaches. Ensuring adequate resources are dedicated to M&E, developing indicators for context and impact that generate information which will address gaps in the evidence base, and including M&E from the start will help to address these challenges.

F. Synthesis of information addressing human settlements

1. Overview

20. Case studies highlighted that climate change, in addition to other stressors (e.g. exploitation of natural resources), affects rural, urban and coastal settlements, and, in turn, disrupts their ecological, social and economic functions.

21. Climate-related hazards affecting human settlements reported in the case studies include:

(a) The increase in impervious surfaces in human settlements together with changing precipitation patterns lead to flooding or increased flood risk. River run-off changes and, as a result of the urbanization of river banks, the changing river run-off leads to flooding and increased flood risks. Flooding was reported as a key climate hazard in 29 case studies;

(b) Sea level rise increases the likelihood of high floods and seawater intrusion posing a risk to coastal settlements, from small settlements in small island developing States to megacities such as New York. Increasing pressure from development and exploitation of natural resources and loss of protective ecosystems further intensifies the vulnerability of coastal settlements. Sea level rise and storm surges were reported as key climate hazards in 21 case studies;

(c) The densification of the population and the lack of green space in urban environments compounded with more severe and frequent extreme heat increase the urban heat island effect in cities, leading to poor air quality and exposing a higher percentage of people to climate-related health risks.

2. Tools and methods

22. Various tools and methods have been developed for and applied to adaptation planning processes addressing human settlements, including assessment tools for evaluating climate risks for the business and engineering sectors within settlements.

3. Good practices and lessons learned

23. The case studies identified good practices for processes and structures conducive to stakeholder engagement, as well as for facilitating the various steps in the adaptation planning process, which are summarized below:

(a) Collaboration with both private and public sectors at the local level, for example through public–private partnerships, is crucial to ensure that the adaptation planning process leads to transformative social learning, acceptance of adaptation solutions and resilient cities and municipalities. Public–private partnerships often help harness the potential of local communities with first-hand knowledge of local climate conditions;

(b) Co-construction of existing local, traditional, ecological and scientific knowledge through inclusive, participatory processes helps create robust and mutually acceptable solutions by avoiding perceived conflicts of interest and problems resulting from differing views;

(c) While acknowledging the role of inclusive, participatory processes in effective adaptation planning addressing human settlements, it is also imperative to have an effective leader in creating and building momentum through providing capital funds; creating economic incentives for greening strategies; communicating the results of the good practices to create goodwill in the community; and institutionalizing good practices;

(d) Measuring, documenting and communicating good practices provides an effective means by which to enhance awareness and replicate such practices at all levels;

(e) Economic and livelihood diversification could serve as an effective approach in creating settlements that are resilient to climate change. Developing and implementing local strategies that create job opportunities, in particular green jobs, helps engage public and private sectors. Tools for livelihood diversification can help bring transformative changes to development;

(f) Investment in engineering prototypes can act as a springboard for ‘climate proofing’ settlements. Simple and low-cost pilot interventions could be used as launching pads for actions that enhance resilience to climate change, especially in rural and low-income settlements;

(g) To be adaptive and resilient to climate change, interventions must be decided through an informed and iterative planning process with the participation of all stakeholders.

24. A range of factors that influence success emerged from the case studies. These include: successful public–private partnerships; integration and/or alignment of climate change adaptation into sectoral and development planning processes; access to robust, context-specific climate and other scientific data and information; and co-production of knowledge supported with effective training, ongoing learning, and communication of results and outcomes to the knowledge holders.

25. Enhancing adaptive capacity and reducing the vulnerability of the most exposed population; using innovative low-cost prototypes of adaptation measures, leveraging local knowledge and resources; and generating economic incentives as a part of adaptation solutions are some of the main considerations for creating resilient settlements.

26. The case studies also reported a number of challenges. These include: a gap between research output and operational needs of users; a lack of emphasis in the adaptation responses on the poorest population in human settlements who are often the most exposed or vulnerable to climate hazards; and lack of adequate financial instruments and resources.

G. Synthesis of information addressing water resources

1. Overview

27. Recognizing the intrinsic linkage between inland and non-inland water resources and other sectors and ecosystems, the sensitivity of the water cycle to climate-related changes and the great challenges in using climate models to project such changes, and the longevity (decades to centuries) of water management interventions, the case studies addressing water resources highlighted that climate change increases the vulnerability of water resources. Both availability and accessibility (quantity) and degradation (quality) of water resources are affected by climate change, leading to adverse impacts on ecosystems and biodiversity; agriculture and food security; land use and forestry; water supply and sanitation; health; and urban settlements and infrastructure. Impacts on regional water availability and accessibility could lead to regional water crises, resulting in economic destabilization and conflict, which would affect poor and vulnerable people the most.

2. Tools and methods

28. Various tools and methods have been developed for and applied to adaptation planning processes addressing water resources, including guidance and risk assessment frameworks for determining the risk to other sectors (e.g. infrastructure, energy, agriculture, ecosystems) that results from the vulnerability of water resources to climate change.

3. Good practices and lessons learned

29. The case studies identified good practices for adaptation planning processes for water resources, some of which are:

(a) The effective alignment of national and local institutions, policies and plans to facilitate the identification and integration of effective responses to climate-induced hazards;

(b) Recognizing the transboundary nature of water resources affecting communities from different countries and regions at all levels, an inclusive and structured process to engage stakeholders at the lowest accountable level helps manage conflict and promote ownership of adaptation interventions. A mix of top-down and bottom-up measures (from the transboundary or international level to the regional, national and local levels) are beneficial in this context. Bilateral frameworks and directives could also provide the necessary political will and help in accessing financial resources;

(c) Inclusive and iterative processes for planning and appraising adaptation options, including assessment of priorities and trade-offs, are key to designing successful context-specific adaptation interventions and avoiding potential maladaptation. An iterative process of mutual learning, participatory techniques and a bottom-up approach ensures that stakeholders play an active role in determining appropriate strategies for the management of river basins;

(d) Public–private partnerships could help ensure success with a decentralized decision-making process;

(e) Innovative financial systems trigger cost-effective solutions;

(f) Inclusive, interdisciplinary, systematic assessments of climate change impacts and analyses of future climate risks to water resources help decision-making on adaptation interventions with socioeconomic and environmental considerations;

(g) Decision-making for the planning, design, financing and operation of water infrastructure is often made under conditions of great uncertainty. Investments in water infrastructure need to consider both current and future risks at all stages of development if the infrastructure is to be robust and resilient to climate change;

(h) Co-production of knowledge leads to locally appropriate, cost-effective adaptation solutions. Demonstration projects have been essential in confirming the benefits and inspiring wider adoption and scaling up of such projects;

(i) Strengthening local adaptive capacity to sustain livelihoods is a useful entry point to meaningful engagement of communities on water security;

(j) Livelihood diversification solutions inspire local commitments and actions to resilience.

30. A range of factors that influence success emerged from the case studies. These include: a sound legal and institutional framework and a flexible and responsive governance system; shared scientific knowledge; a clear and strong political mandate and commitment; and intersectoral coordination for transboundary water resources management. Capacity-building and co-production of scientific, local and indigenous knowledge were also considered factors related to success.

31. The case studies also reported a number of challenges. These include a lack of political will, local institutional set-up (or local ownership) and financial commitment among countries sharing the transboundary water resources leading to a lack of coordinated action to reduce vulnerability. Time investment, which is often crucial in building collaborative partnerships to manage water resources, was also cited as a challenge.

H. Synthesis of information addressing health

1. Overview

32. The case studies addressing health highlighted that climate change exacerbates the environmental determinants of health, such as through its risk to water resources, infrastructure and sanitation, hence posing a serious health risk to societies, especially their vulnerable groups (e.g. the elderly, infants and young children, chronically ill people and people who work outdoors).

33. The case studies reported that climate-related hazards affecting health include the following:

(a) More frequent and intense extreme weather events such as floods, cyclones and droughts, shifting weather patterns and extreme heat (such as heatwaves) increase the risk of disease and death related to such hazards;

(b) Sea level rise, seawater intrusion and coastal inundation can produce new breeding grounds for mosquitoes, increasing the risk of waterborne diseases such as dengue fever and malaria. Sea level rise was reported as a key climate hazard in seven case studies;

(c) Drought leads to the more common occurrence of nutrition-related diseases. Drought was reported as a key climate hazard in 10 case studies.

2. Tools and methods

34. A range of tools and methods has been developed for and applied to assessing risks and vulnerability, adaptation planning, and M&E, including methodological frameworks that facilitate an iterative process involving various steps from initial risk identification to the measurement of the progress of adaptation actions.

3. Good practices and lessons learned

35. Good practices for processes, structures and approaches that are conducive to stakeholder engagement and good practices that facilitate the steps in the adaptation process have been reported in the case studies:

(a) Considering the interlinkages and interdependencies of health with other sectors, such as transport, energy, water resources, food security and agriculture, and human settlements, robust multisectoral mechanisms engaging interdisciplinary stakeholders at the national and subnational levels are conducive to building health systems that are resilient to climate change;

(b) Inclusive processes that engage local and indigenous people often help secure ownership and develop and strengthen local institutional capacity in delivering results in meaningful and locally appropriate ways;

(c) Innovative and flexible funding structures help decentralize engagement to the lowest accountable level;

(d) Co-production of scientific, local and indigenous knowledge is effective in responding to community needs and priorities;

(e) Integration of climate-related health risks into existing national and sectoral plans and policies is conducive in developing health systems that are resilient to climate change;

(f) Developing and disseminating evidence of health benefits (e.g. reduced health impacts, reduced health-care costs) and co-benefits to other sectors (e.g. water security) from adaptation actions could help build local and political ownership of such actions addressing health;

(g) Documenting and disseminating information and knowledge on health impacts of climate change, health-related vulnerability and adaptation assessments, and adaptation plans and actions provide an important knowledge base and a helpful basis for scaling up and scaling out good practices.

36. The case studies identified a range of factors and considerations that could potentially contribute to effective adaptation addressing the impacts of climate change on health. These include: engagement and capacity strengthening of relevant stakeholders within different sectors and at different levels; adoption of an iterative process that enables continued learning, assessment of evolving needs and capacity-building of communities; integration of climate change risks and the need for adaptation and its associated resource implications into broader sectoral and national policy and planning processes; and identification and adoption of technological solutions with the potential to generate widespread benefit.

37. Efforts to adapt to climate change impacts in the area of health have been hampered by, among other things: gaps in awareness, knowledge and understanding of potential climate change impacts on health; technical capacity for analysing risks and planning for

effective adaptation; and financial resources, including those for ensuring the continued engagement of local and community level stakeholders and for investment in critically important and effective technological solutions. Work is being carried out, however, to address these impediments, including providing access to international experts to address challenges related to technical capacity, and adopting a flexible and decentralized funding structure to provide local and vulnerable communities with the ability to determine how to best use the financial resources made available from higher level authorities.

I. Good practices for monitoring and evaluation

38. The following good practices for M&E of adaptation addressing the four thematic areas referred to in paragraph 2 above emerged from the case studies:

(a) Participatory M&E systems used in some of the case studies are useful for maintaining the adaptive capacity of communities and helping build long-term monitoring. Inclusive, participatory processes that engage local and indigenous communities also strengthen the evaluation process;

(b) Monitoring livelihood benefits in integrated approaches beyond those fundamental for tracking the impact on vulnerability reduction can help provide information that can support the scaling up such approaches and soft approaches that also yield tangible benefits for climate change mitigation and adaptation;[9]

(c) Iterative adaptive processes are key to assessing and amending plans and actions in the light of future climate risks and information. Frameworks and processes with anticipatory and iterative components allow evaluation and improvement of activities;

(d) Evidence-based systems with measurable indicators are useful for monitoring the progress of adaptation interventions and scaling up good practices. Setting attributable indicators for a baseline helps in evaluating the progress of an adaptation intervention.

J. Synthesis of information addressing processes and structures for linking national and local adaptation planning

1. Overview

39. Given the multisectoral and multilevel nature of climate change impacts, as well as the contrast between the importance of local adaptation action and the concentration of financial and technical resources at the national level, linking national and local adaptation planning is particularly relevant and important for effective adaptation.

2. Tools and methods

40. The case studies focusing on linking national and local adaptation planning reported a range of methods and tools, such as guidelines, in support of decision-making on adaptation at different levels.

41. A comprehensive framework that uses local indicators and can be aggregated to subnational and national levels could serve as an effective tool in assessing the overall aggregate impact of local actions at the national level, which can help to inform the evidence base.

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[9] IUCNE15.

3. Good practices and lessons learned

42. Several good practices have emerged in regard to stakeholder engagement and various processes and structures that facilitate linking national and local adaptation planning:

(a) Strengthening national and local institutional frameworks catalyses transformational change and helps to replicate good practices;

(b) The provision of funding or direct access to funding facilitates the linkage of local and national adaptation planning. Integrating climate change adaptation considerations into sectoral and development planning processes of local bodies and governments helps to strengthen the linkage between local and national adaptation planning;

(c) Promoting co-production of knowledge through an inclusive, multidisciplinary and structured process provides a strong impetus to harmonize top-down and bottom-up approaches and such processes also enable the consideration of the multisectoral dimension of climate change in adaptation actions;

(d) Knowledge-sharing and learning at all levels and across multiple sectors is conducive to informing adaptation planning processes at national and local levels.

43. The case studies identified a number of factors that influence success for effectively linking national and local adaptation planning. These include: strengthening institutional capacity; recognizing and leveraging existing networks and partnerships; implementing structured strategic processes for knowledge-sharing and learning among stakeholders at different levels; collaborating with existing civil society networks and platforms; making provisions for funding and access to funding to ensure the linkage between national level processes and policies and local level knowledge and action; and promoting the co-production of knowledge to harmonize top-down and bottom-up knowledge approaches and to enable a cross-sectoral integrated approach to adaptation.

44. Insufficient capacity, inadequate national level coordination structures or mechanisms, and a lack of specific guidance are among the key challenges identified in the case studies for effectively linking national and local adaptation planning. But efforts are being made to address them, including through the process to formulate and implement national adaptation plans (NAPs) to strengthen capacity for public institutions and to facilitate coordination for adaptation planning and practices at different levels.

K. Conclusions and next steps

45. Certain common elements have emerged on adaptation planning processes addressing ecosystems, human settlements, water resources and health, as well as on linking national and local adaptation planning. This chapter highlights these key common elements, including gaps in relation to the provision and dissemination of information and knowledge, which could be considered as a basis for possible next steps, in the context of the NWP.

46. The findings in chapter I.E–H provide evidence of the links between ecosystems – at the level of species, genetic diversity within species and ecological interactions – and water resources, health and human settlements, hence supporting the notion that adaptation planning and practices are often cross-thematic and yield benefits in more than one thematic area. For example, there was recognition in the case studies of the role that healthy ecosystems play in increasing the resilience of communities and helping people adapt to climate change through the delivery of a wide variety of services that help maintain human

well-being. Human settlements also show evidence of the link with other thematic areas, including water resources, environmental services and health.

47. In regard to the integration of gender-sensitive strategies and tools and of indigenous and traditional knowledge, the following key messages have emerged:

(a) It is important to develop and use information and knowledge from all sources, including co-constructing traditional, local and contemporary scientific sources, recognizing cultural and gender sensitivities, and ensuring that all such information is gathered and validated, if possible, through a systematic process. Such co-construction processes help empower local communities, promote shared understanding of the issues and strengthen the capacity of communities to implement adaptation actions;

(b) Inclusive processes that engage all members of a community (including men, women and indigenous people) often help secure ownership and develop and strengthen local institutional capacity to deliver results in meaningful and locally appropriate ways. Hence, it is imperative to have information and a knowledge exchange among all members of the community, scientists and policymakers to inform the decision-making process and make it more inclusive.

48. Although some case studies provided examples of good practices, a number of gaps and challenges exist in relation to the provision, documentation and dissemination of information and knowledge, including on collaborative partnerships at multiple levels, for scaling up adaptation actions addressing the four thematic areas referred to in paragraph 2 above. Knowledge and information issues that would be useful for adaptation practitioners and policymakers to consider in the light of these gaps and challenges are as follows:

(a) It is crucial to disseminate the scientific findings of the local impacts of climate change at the regional level. While producing good science is important, communicating the results is essential. Communication tools are crucial and need to be tailored to stakeholders and audiences;

(b) Documenting and disseminating information and knowledge at all levels and across multiple sectors is conducive to informing adaptation planning processes at national and local levels. Documenting and disseminating information and knowledge on the impacts of climate change addressing various themes, vulnerability and adaptation assessments, and adaptation plans and actions provides an important knowledge base and a helpful basis for scaling up and scaling out good practices;

(c) The co-production of knowledge (i.e. scientific, local and traditional knowledge) is effective only when supplemented with effective training, ongoing learning and communication of results and outcomes of adaptation projects and practices to the knowledge holders;

(d) Adaptation planning and actions that are flexible and responsive to capacity and political structure at all levels have led to increased acceptance and increased ability of people to respond to changing needs. The flexibility and responsiveness can be best ascertained when adaptation plans and priorities use the evidence base of knowledge for current variability and future impacts, institutional arrangements, the sociopolitical context and capacity at different levels, and when there are mechanisms in place for regular review in the light of new knowledge, unexpected events and changes in capacity. For example, explaining the links between ecosystem and adaptation projects and national priorities, plans, programmes, strategies and policies, including the process to formulate and implement NAPs, is useful;

(e) The process to formulate and implement NAPs under the Cancun Adaptation Framework offers an important opportunity for countries to link national planning processes to local knowledge and experiences. However, specific guidance, measures and mechanisms are needed to link local experiences and national priority-setting processes;

(f) Clear measures of effectiveness disaggregated to demonstrate the impact on reducing the vulnerability of different groups, sectors and locations are essential. These measures are often hindered by a lack of clarity on how project goals and activities are linked to addressing vulnerability to specific climate hazards, trends and variability by managing ecosystems;

(g) There is a need to build understanding of the time required to obtain positive results in relation to adaptation goals of different adaptation approaches;

(h) Information used in assessing the replicability of adaptation approaches, such as the resources required, and more detailed information on the scale of the intervention and how this relates to the scale of the impacts is critical for effective adaptation planning and practices.

49. In addition to gaps with regards to the provision and dissemination of information and knowledge on good practices and lessons learned, the following actions are recommended in the light of gaps and challenges to scale up adaptation actions addressing these issues:

(a) Capacity-building activities and adequate national level coordination structures or mechanisms are essential for effectively linking national and local adaptation planning. The process to formulate and implement NAPs could provide a useful entry point through which to strengthen the capacity of public institutions and to facilitate coordination for adaptation planning and practices at different levels;

(b) Enhancing the technical capacity to analyse risks and planning for effective adaptation are critically important and effective technological solutions;

(c) In addition to adequate financial resources and financial instruments, a flexible and decentralized funding structure is also critical. Such a structure will provide local and vulnerable communities with the ability to determine how best to use the financial resources made available to them from higher level authorities for scaling up adaptation planning and practices;

(d) Political will, local institutional set-up (or local ownership) and financial commitment among countries sharing the transboundary water resources can be crucial to ensure successful coordinated action to reduce vulnerability of such transboundary water resources. Time investment, which is often crucial in building collaborative partnerships to manage water resources, will be also crucial in this regard;

(e) An effective M&E mechanism is also an integral part of the adaptation planning processes. The creation of this mechanism could include developing, among others, a phased approach to risk assessment; and an understanding of how to measure, attribute, put a time frame on (where impacts may take a long time to detect), cost, identify the impacts of, and build an evidence base. Ensuring adequate resources are dedicated to M&E; as well as developing indicators that cover context, impact and generate information that will address gaps in the evidence base; and including M&E from the start will help in this process.

II. Synthesis report

[English only]

A. Mandate

50. SBSTA 40 requested the secretariat, under the guidance of the Chair of the SBSTA, in collaboration with the Adaptation Committee and the Least Developed Countries Expert Group, and with contributions from relevant partner organizations of the NWP, including regional centres and networks, to develop case studies, as appropriate, that highlight the following, for consideration at SBSTA 43:[10]

(a) Available and implemented tools and methods for adaptation planning processes addressing the four issues of ecosystems, human settlements, water resources and health;

(b) Good practices and lessons learned in relation to adaptation planning processes, including on M&E, addressing the four issues mentioned above;

(c) Good practices and lessons learned, related to processes and structures for linking national and local adaptation planning.

B. Background

51. COP 19 decided to continue the NWP within the framework of the provisions of decision 2/CP.11, addressing the knowledge needs arising from the Cancun Adaptation Framework and other relevant workstreams and bodies under the Convention and the knowledge needs identified by Parties.[11] COP 19 also requested the SBSTA to consider, under the NWP, the four thematic areas of ecosystems, human settlements, water resources and health.[12]

52. In accordance with decision 17/CP.19, SBSTA 40 agreed on a set of activities under the NWP, by 2015, so that information and knowledge may be collected, analysed and disseminated in order to inform adaptation planning and actions at the regional, national and local levels in relation to, inter alia, ecosystems, human settlements, water resources and health.[13]

C. Scope of the note

53. This document provides a synthesis of 170 case studies[14] contributed by Parties and NWP partner organizations, including regional centres and networks. Thematic experts

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[10] FCCC/SBSTA/2014/2, paragraphs 20 and 24.

[11] Decision 17/CP.19, paragraph 1.

[12] Decision 17/CP.19, paragraph 5.

[13] FCCC/SBSTA/2014/2, paragraph 19.

[14] Submitted to the secretariat as at 18 June 2015.

from NWP partner organizations helped in the review of this document to ensure that it is factually faithful to the original case studies.[15]

54. Chapter II.D below provides an overview of the case studies, including their distribution by thematic area and region. Chapter II.E–H provides a synthesis of the information contained in the case studies, with each chapter addressing one thematic area (ecosystems, human settlements, water resources and health, respectively). Each of these subchapters presents an overview of the thematic area, the tools and methods used, and the good practices and lessons learned.[16, 17] Chapter II.I analyses the case studies that focus on processes and structures for linking national and local adaptation planning. Chapter II.J concludes the synthesis report with possible next steps. It also provides information that would be useful for adaptation practitioners and policymakers in the light of the gaps and challenges identified.

55. Annex I contains a full list of the case studies. Annex II contains the tools and methods for adaptation planning processes provided in the case studies. Both annexes are organized by thematic area.

D. Overview of the case studies

56. A total of 170 case studies were contributed by Parties and NWP partner organizations in line with the mandate outlined in paragraph 50 above and in response to the invitation issued by the secretariat. The case studies comprise 47 submitted by 21 Parties and 123 submitted by 43 NWP partner organizations. Of the 170 case studies, 153 focus on the thematic areas referred to in paragraph 51 above and 17 focus on processes and structures for linking national and local adaptation planning.

57. While most of the 153 thematic case studies address more than one theme, one primary thematic area was identified for each case study for the purpose of the analysis. Recognizing that most case studies addressed more than one theme, these secondary themes are illustrated in figure 1 above, which shows the distribution of the primary and secondary themes of these case studies.

58. The 17 case studies focusing on processes and structures for linking national and local adaptation planning also addressed water resources (12), human settlements (11), ecosystems (10) and health (9). Of the total 170 case studies, 127 provided information on ongoing adaptation planning and 43 provided information on completed actions.

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[15] Experts from the Alliance for Global Water Adaptation, the Global Water Partnership, the International Union for Conservation of Nature, the Stockholm International Water Institute, the United Nations Human Settlements Programme, the United Nations Environment Programme, the World Conservation Monitoring Centre and the World Health Organization reviewed a draft version of this document.

[16] In the synthesis, good practices include but are not limited to processes and structures that: (1) are particularly conducive to stakeholder engagement; (2) consider traditional, indigenous and local knowledge; (3) include monitoring and evaluation to inform iterative adaptation planning; and (4) are concrete examples from the case studies submitted. Lessons learned highlight and summarize factors that influence success as well as challenges, without explicit reference to any examples; rather, they are based on overall assessment of the case studies under each thematic area.

[17] Please note that although not all case studies listed in annex I are referred to in this document, relevant information from all these case studies has been taken into account to compile good practices and lessons learned. Where practical, examples from a selection of case studies are used to illustrate good practices.

59. Consideration of indigenous and traditional knowledge was identified in 33 case studies. Gender-sensitive approaches and/or different roles for men and women were discussed in 36 case studies. Information on M&E was included in 116 case studies.

60. The majority of the case studies were from Asia and Africa. Figure 2 above shows the regional distribution of the case studies.

61. Each case study was assigned a code (see annex I for the code, title and other information on each case study, and annex II for the tools and methods used in each case study; both annexes are organized by thematic area). Throughout this document, where appropriate, case studies are referred to by these codes (which are provided mostly in footnotes).

E. Case studies addressing ecosystems

1. Overview

62. The case studies addressing ecosystems highlighted the fact that climate change affects ecosystems, their functions and the many benefits and services that they provide to society. The case studies recognized that ecosystems are complex and are interconnected; that they evolve and change over time; and that one of the major drivers of long-term ecosystem change is climate change. Therefore, the case studies indicated that adaptation processes addressing ecosystems need to occur at appropriate spatial and temporal scales.

63. The case studies presented adaptation activities that address a range of climate-related hazards, including:

(a) Drought (36), related to increased summer aridity leading to decreased water availability, decreased rangeland productivity and an increased risk of fires in forests, drylands, croplands and grasslands;

(b) Flood (27), which in turn results in an increase in landslides, and glacial retreat in mountain ecosystems and inland waters;

(c) Shift of seasons (24), related to change in marine systems as a result of large-scale climate shifts.

2. Tools and methods

64. A wide range of tools and methods has been reported in the case studies (see annex II for details). They are mainly available and have been implemented for:

(a) Assessing current and future vulnerability;

(b) Planning, identifying and appraising options for adaptation;

(c) M&E.

65. Ecosystem-based approaches (EBAs) for adaptation to climate change are commonly described in the case studies. EBAs use biodiversity and ecosystem services in an overall adaptation strategy. They include the sustainable management, conservation and restoration of ecosystems so as to provide services that help people to adapt to the adverse effects of climate change. EBAs can be cost-effective and generate social, economic and cultural co-benefits; and contribute to the conservation of biodiversity. They include the

sustainable management, conservation and restoration of ecosystems to provide services that help people to adapt to the adverse effects of climate change.[18]

66. The case studies reported on hybrid approaches to societal adaptation (combinations of EBAs and hard (engineered, infrastructural) approaches), and approaches to support the adaptation of ecosystems, with their main focus being helping species and habitats to adapt to climate change. It was underlined that a conceptual separation between ecosystem-based adaptation and adaptation of ecosystem approaches is needed, while recognizing the broader role that ecosystems could play in actions to combat climate change.

67. Assessment of the financial viability of EBAs is often an important part of the appraisal of adaptation options. To help select and promote suitable ecosystem-based adaptation strategies and options, tools and methods were provided for microfinance institutions to develop and implement financial products and services.[19] Providing these institutions with such tools and methods facilitates the inclusion of climate risks in the financial products and services, thereby generating ‘climate smart’ lending methodology.

68. The case studies provided examples of tools, frameworks and M&E indicators for adaptation actions addressing ecosystems. M&E indicators highlighted by the case studies include the following:[20]

(a) Improvement in the health of the ecosystem and its biophysical conditions (e.g. health and population of endangered species);

(b) Evidence of reduction in social vulnerability and improvement in adaptive capacity (e.g. increase in social assets, strengthened local institutions);

(c) Evidence of stakeholders’ knowledge and understanding (including members of local communities) of how to: implement EBAs, hybrid approaches and adaptation of ecosystem approaches; commission vulnerability assessments that integrate ecosystem considerations; and process information being produced by ecosystem and adaptation projects;

(d) Ability to make flexible, forward-looking decisions and evidence of knowledge of how to integrate a consideration of ecosystems and adaptation into national plans, programmes, strategies and policies.

3. Good practices

69. The case studies identified good practices for implementing ecosystem and adaptation projects. A selection is highlighted below.

70. **Participatory decision-making that is decentralized to the lowest accountable level, and is iterative, inclusive and adaptive is critical:**

(a) Interactive and shared learning and participatory decision-making help build local ownership. Promoting open dialogue, building local institutional capacity, and promoting participation in assessment, appraisal and implementation of adaptation measures are essential ingredients for empowering local communities in their role as local stewards for enhancing the resilience of ecosystems, which is fundamental to the sustainability of the intervention. In all such examples, the common denominator was to build trust and credibility through coordinated and participative actions with key stakeholders;[21]

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[18] Convention on Biological Diversity. 2009. *Connecting Biodiversity and Climate Change Mitigation and Adaptation. Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change.* Montreal: Convention on Biological Diversity. Available at <https://www.cbd.int/doc/publications/cbd-ts-41-en.pdf>.

[19] FS-UNEPE34.

[20] IUCNE05, CAREE26.

(b) Developing a participatory benefit-sharing model for natural regeneration of forests and forest management projects, for example, can help establish a strong sense of shared ownership among direct beneficiaries;[22]

(c) Building and instilling local institutional capacity could involve strengthening existing social, technical and political actors, institutions and decision-making bodies through targeted training and peer-to-peer learning;[23]

(d) The inclusion of women and of poor, vulnerable and marginalized communities in adaptation planning has proven effective given their direct dependence on ecosystems for their livelihoods;[24]

(e) Flexibility in the design and implementation of adaptation options has led to the increased ability of people to respond to climate change and future uncertainty.[25]

71. **Information and knowledge from all sources, including co-construction of knowledge from traditional, local and contemporary scientific sources, should be used to ensure that cultural and gender sensitivities are addressed and robust information is gathered and validated:**

(a) The coupling of local knowledge (e.g. institutional knowledge of practitioners or indigenous knowledge on climate change impacts, seasonal shifts in vegetation and ecosystem services; knowledge of foresters on agroforestry practices) with scientific knowledge helps to ensure the robustness of local knowledge and verify scientific knowledge, which may have been formulated at a different scale or using information from elsewhere, while at the same time facilitating understanding of the scientific information. Such coupling or co-construction of knowledge could be facilitated through iterative learning processes, focused workshops and meetings between scientists and local knowledge holders and decision makers;[26]

(b) Supporting the application of local knowledge can be helpful in identifying economically and socially viable solutions (e.g. locally appropriate solutions) to build the resilience of natural and societal systems.

72. **Involvement of both government and non-government stakeholders is key to ensuring effective adaptation planning processes.** Building partnerships with both government and non-government stakeholders is integral in supporting more resilient development and avoiding conflicts and inequalities.

73. **Integration and inclusion of adaptation initiatives in existing development plans and sectoral strategies can help secure financing, achieve alignment between plans and strategies that may otherwise negatively impact on adaptation initiatives, and facilitate effective coordination among key stakeholders and implementation of adaptation actions.** A case study from Canada[27] provides an example of how the inclusion of adaptation initiatives in local development plans and programmes helps to secure financial resources and integrate climate-related risks in existing forest management

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[21] SEIE16, UNDPE01.

[22] UNDPE29, EthiopiaE27.

[23] EcuadorE02, ICIMODE39.

[24] CAREE26.

[25] CAREE26.

[26] IUCNE05, CAREE26, CanadaE03.

[27] CanadaE13.

programmes. In an International Union for Conservation of Nature (IUCN) case study,[28] in addition to financial provision, such inclusion helped subdistrict administrative organizations to coordinate effectively with other administrative organizations and government agencies in support of the adaptation initiatives.

74. **Economic and livelihood diversification serves to enhance the resilience of people. Such diversification might also help address the resilience of ecosystems through reducing drivers of degradation:**

(a) Diversifying economic activities and livelihoods to include resilient options can help not only in addressing natural resource degradation but also in supporting longer term livelihood security and helping to build important natural capital and social infrastructure. In an IUCN example,[29] the communities of Mai Root and Laem Klat in Thailand are diversifying their livelihoods beyond fisheries to improve their resilience and that of the ecosystem they depend on to sea level rise and extreme storm events. The provision of ecotourism jobs, created through the establishment of national parks, has provided an alternative livelihood in an example provided by the World Wide Fund for Nature (WWF);[30]

(b) The Community Environment Conservation Fund used by IUCN[31] combines natural resource management and livelihood aspects; empowers local communities to directly participate in natural resources management; promotes accountability and governance of natural resources; and provides access to credit in order to diversify livelihood options while reducing pressure on natural resources within the catchment area. Blue Ventures[32] focused on improving biodiversity and marine health in Madagascar in order to increase the sustainable yield for local communities, where coastal resources, critical to the livelihoods of the Vezo people and deeply tied to their culture, are threatened because of the growing human population and continued exploitation of marine resources, exacerbated by coastal erosion and coral reef damage;

(c) In an example from Kenya,[33] a project is seeking to develop a viable financial mechanism for the payment of watershed services that delivers sustainable natural resource management, reduced vulnerability and improved livelihoods. The model will serve as a pilot and learning model for expansion and replication.

75. **Provision of financial resources does not guarantee the successful implementation of adaptation actions unless it is coupled with effective institutional set-up, sustainable financial schemes and non-financial services such as education programmes:**

(a) The provision of financial services for communities in remote and high risk areas can only be successful when combined with specific risk reduction and adaptation strategies and locally relevant financial schemes, such as micrograms, insurance schemes and mutual benefit schemes;[34]

(b) The bundling of non-financial services plays a critical role in the success of any financial scheme. In examples provided by International Labour Organization[35] and

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[28] IUCNE05.

[29] IUCNE05.

[30] WWFE08.

[31] IUCNE14.

[32] BlueVenturesE42.

[33] KenyaE40.

[34] ILOE06, UNDPE29.

[35] ILOE06.

Nestlé,[36] financial literacy sessions (focusing on budgeting, farm planning, managing credit and saving) helped farmers to understand the benefits and risks of financial products and their specific terms (e.g. interest rates, premiums), as well as their rights and responsibilities in the use of the loans.

76. **M&E is important for measuring the effectiveness and efficiency of adaptation actions:**

(a) Participatory M&E systems used in some of the case studies help to establish long-term monitoring and enable stakeholders involved in the adaptation action to undertake adaptive management;

(b) Monitoring livelihood benefits in integrated approaches beyond those fundamental for tracking impact on vulnerability reduction can help to provide information that can support the scaling up of such approaches and nature-based solutions that also yield tangible benefits for climate change mitigation and adaptation (e.g. benefit of mangrove restoration on aquatic animal harvest in the context of climate-related hazards (cyclones, typhoons, storm surges) as well as salinization of soils and freshwater supplies);[37]

(c) Adaptive management is an important tool for ensuring the continued success of programmes and activities.

4. Lessons learned and factors that influence success

77. The participation of stakeholders resonates through almost all of the case studies as one of the criteria for success. Working with all stakeholders, especially local communities, to analyse climate change vulnerabilities as well as to conceptualize and appraise adaptation measures, helps to build trust, shared ownership and support for the adaptation planning process.

78. Co-construction of indigenous and scientific knowledge and co-design of adaptation measures helps to empower local communities, promote shared understanding of the issues and strengthen the capacity of communities to manage ecosystems. It is imperative to complement such coupling exercises with inclusive processes, iterative learning processes and strengthening of the local institutions.

79. Given the interconnectedness and interdependence of different ecosystems and the relationship between human activities and ecosystems, ecosystem management is influenced by the actions of multiple sectors. High-level coordination across multiple sectors that have convening power and leadership, as well as responsibility over natural resources, facilitates the scaling up of good practices from the local to the national context and the identification of potential benefits and trade-offs between development, environment and adaptation priorities – and therefore the integration of EBA and climate resilience into existing development strategies and plans. This is particularly helpful in leveraging financing for adaptation actions when climate investments are scarce and fragmented.

80. One of the key parameters in the successful implementation of EBA is to work at the most appropriate scale, recognizing the functional scale of the ecosystem concerned. Transboundary cooperation may be necessary in order to access information and data (e.g. climate data) and coordinate activities if the focal ecosystem spans administrative

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[36] NestléE12.

[37] IUCNE15.

boundaries. Intergovernmental agencies, regional centres and networks could play a critical role in facilitating such cooperation and coordination.[38]

81. Adaptation planning and actions that are flexible and responsive to capacity and political structure at all levels have led to an increased acceptance of adaptation actions and has increased the ability of people to respond to changing needs. This is best ascertained when adaptation plans and priorities use the evidence base of knowledge for current variability and future impacts, institutional arrangements, the sociopolitical context and capacity at different levels, and when there are mechanisms in place for regular review in the light of new knowledge, unexpected events and changes in capacity.

82. The case studies have demonstrated that one of the successful ways to secure community ownership of adaptation planning and stewardship of ecosystems is through economic diversification, which offers a means for livelihood security in addition to the restoration of ecosystem services.

83. Non-climate drivers of change are numerous and significant, particularly in the short and medium term. An adaptation project cannot be implemented in isolation of these drivers, given that they often underlie ecological and socioeconomic vulnerability. An effective way to take these drivers into account is to ‘unpack’ adaptive capacity and ensure that the overall adaptation strategy not only includes concrete measures such as green infrastructure, but also focuses on building the necessary adaptive capacity of all involved stakeholders, thereby increasing socio-ecological resilience.[39]

5. Challenges and possible ways to address them

84. Maintaining the high level of time commitment from all actors throughout the stages of adaptation planning and balancing diverse expectations is often challenging. As demonstrated by some case studies, this could be addressed through thorough (i.e. being cognizant of expectations and limitations and assessing risks and opportunities), flexible (i.e. considering trade-offs and building consensus on common pathways) and inclusive engagement approaches.[40] Obtaining data and analysing downscaled climate data can be challenging in some countries (e.g. because of a lack of data or a lack of finance or technology and technical capacity to access and analyse data) and can often be a limiting factor in understanding vulnerability and future risk of various ecosystems. This could be addressed, to some extent, by undertaking vulnerability assessment in a phased manner, and using existing institutional, local and indigenous knowledge, information and tools to inform initial adaptation planning.

85. M&E is important to measure the effectiveness and efficiency of adaptation approaches and make adjustments as necessary. However, challenges in monitoring and evaluating adaptation planning processes addressing ecosystems exist regarding attribution, time frame, cost, calibration, impacts and evidence base. The success of EBAs often requires a long time frame and a robust learning framework in order to demonstrate the real benefits associated with these approaches. Because of the high cost associated with M&E, there is often an absence of a long-term monitoring programme, impeding the effective measurement of adaptive capacity and ecosystem resilience. The development of a specific M&E methodology could be integrated with financial product development by microfinance institutions to help address this challenge, as is currently planned by the Frankfurt School-United Nations Environment Programme.[41]

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[38] BirdLifeE10, PyreneesE41.

[39] WWFE51, UNDPE29.

[40] SEIE16.

[41] FS-UNEPE34.

F. Case studies addressing human settlements

1. Overview

86. The case studies addressing human settlements highlighted that climate change, in addition to other stressors (e.g. exploitation of natural resources), affects rural, urban and coastal settlements, and in turn disrupts their ecological, social and economic functions.

87. Climate-related hazards affecting human settlements reported in the case studies include:

(a) The increase in impervious surfaces in human settlements together with changing precipitation patterns lead to flooding or increased flood risk. River run-off changes and, as a result of the urbanization of river banks, changing river run-off leads to flooding and increased flood risks. Flooding was reported as a key climate hazard in 29 case studies;

(b) Sea level rise increases the likelihood of high floods and seawater intrusion posing a risk to coastal settlements, from small settlements in small island developing States to megacities such as New York. Increasing pressure from development and exploitation of natural resources and loss of protective ecosystems further intensifies the vulnerability of coastal settlements. Sea level rise and storm surges were reported as key climate hazards in 21 case studies;

(c) The densification of the population and the lack of green space in urban environments compounded with more severe and frequent extreme heat increases the urban heat island effect in cities, leading to poor air quality and exposing a higher percentage of people to health risks.

2. Tools and methods

88. Available and implemented tools and methods reported in the case studies are related to:

(a) Assessing current and future vulnerability;

(b) Planning, identifying and appraising options for adaptation.

89. Several case studies reported city-wide vulnerability and risk assessment tools for urban settlements.[42] There were also examples of assessment tools for evaluating climate risks for individual sectors (e.g. business sector, engineering sector).[43]

90. Examples of tools and methods for planning, identifying and appraising options for adaptation included several planning tools addressing urban settlements;[44] a risk assessment procedure for appraising adaptation options through assessing the climate risk and engineering vulnerability of civil infrastructure to climate change;[45] a tool to mainstream gender consideration into city-level climate change plans and strategies;[46] and an ex ante evaluation framework to support the identification of preferred adaptation strategies.[47]

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[42] KoreaHS07, UCCRNHS11, UCCRNHS20, EEAHS08.

[43] KoreaHS09, StudioHS21, StudioHS22.

[44] EIHS25, NetherlandsHS28, SEIHS19.

[45] WFEOHS30.

[46] UNHabitatHS15.

[47] NetherlandsHS28.

3. Good practices

91. The case studies identified good practices for processes and structures conducive to stakeholder engagement, as well as for facilitating the various steps in the adaptation planning process, which is summarized below.

92. **Collaboration with both private and public sectors at the local level, for example through public–private partnerships, is crucial to ensure that the adaptation planning process leads to transformative social learning, acceptance of adaptation solutions and resilient cities and municipalities:**

(a) The case studies reported positive outcomes in strengthening urban climate resilience through inclusive process-led social learning and innovation. In Stuttgart, for example, a scheme was initiated whereby residents could adopt a tree, resulting in 182 residents now looking after 500 trees;[48]

(b) Public–private partnerships often help harness the potential of local communities, which have a first-hand understanding of local climate conditions. One such partnership led to local development plans and priorities for climate actions, along with the identification of key resources for priority climate actions in Maputo, Mozambique;[49]

(c) Partnership with national institutions such as national meteorological services is helpful in institutionalizing national capacity for scaling up adaptation solutions.[50]

93. **Co-construction of existing local, traditional, ecological and scientific knowledge through inclusive, participatory processes helps create robust and mutually acceptable solutions** by avoiding perceived conflicts of interest and problems resulting from differing views.[51]

94. While acknowledging the role of inclusive, participatory processes in effective adaptation planning addressing human settlements, it is **also imperative to have an effective leader in creating and building momentum** through providing capital funds; creating economic incentives for greening strategies; communicating results of the good practices to create goodwill in the community; and institutionalizing good practices. City mayors have often played such a leadership role, as reported in some case studies.[52]

95. **Measuring, documenting and communicating good practices** provide an effective means by which to enhance awareness and replicate such practices at all levels. The Amsterdam rainproof project[53] made use of an online platform to facilitate the documentation and dissemination of relevant project information and experiences.

96. **Economic and livelihood diversification could serve as an effective approach in creating settlements that are resilient to climate change:**

(a) Developing and implementing local strategies that create job opportunities, in particular green jobs, helps to engage public and private sectors. Tools for livelihood diversification can help bring transformative changes to development.[54] The Kenya Slum Upgrading and Prevention Programme[55] aims to improve the livelihoods of people living and working in slums through targeted interventions to address climate change and infrastructure services (such as regularization of land tenure in slums and informal settlements, resource mobilization for slum upgrading, and prevention initiatives);

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[48] EEAHS08.

[49] SEIHS19.

[50] WFEOHS30.

[51] EEAHS08.

[52] EEAHS08.

[53] NetherlandsHS06.

[54] ILOHS01.

[55] KenyaHS14.

(b) Climate resilience of human settlements could be enhanced through the creation of green jobs. The opportunity for urban planners to create garden centres as part of the Amsterdam rainproof project[56] provides a good example of ‘climate proofing’ a city, which has economic incentives for communities.

97. Investment **in engineering prototypes can act as a springboard for ‘climate proofing’ settlements**. The availability of financial resources to invest in greening physical infrastructure is often key to creating resilient cities, for example, providing financial support for consideration and construction of green adaptation strategies in urban development plans and priorities. The City of Stuttgart[57] has provided financial support to green about 60,000 square metres of roofs since 1986.

98. Simple and low-cost pilot interventions could provide effective local solutions for creating climate-resilient settlements, especially in rural and low-income settlements. For example, school buildings built with locally available materials in Mozambique have a dual purpose – they also offer shelter to communities in case of floods or cyclones.[58]

99. **To be adaptive and resilient to climate change, interventions must be decided through an informed and iterative planning process** with the participation of all stakeholders. The National Delta Programme in the Netherlands has an in-built cyclic adaptive planning (with a step-by-step approach) and decision-making pathways to address future climatological and socioeconomic uncertainties.[59]

100. **M&E of adaptation responses is important for avoiding potentially maladaptive developments**. Successful implementation must be supported by appropriate arrangements and M&E indicators so that necessary adjustments can be made. The adaptive capacity of infrastructure – ascertained by monitoring design, operation and maintenance – could serve as a good indicator to measure the resilience of human settlements to future climate changes, including extreme events.[60]

4. Lessons learned and factors that influence success

101. Local institutions are often at the forefront of developing strategies and implementing programmes to improve disaster preparedness and crisis response in cities. Therefore it is important to build local institutional capacity in both public and private sectors. **Public–private partnerships often play an essential role** in building resilient cities.

102. **Integrating or aligning climate change adaptation considerations into sectoral and settlement-wide development planning processes** of local bodies and governments helps to strengthen the linkage between local and national adaptation planning, ensuring greater recognition and facilitating the implementation of adaptation measures.

103. **An integrated approach** with a mix of soft and hard measures often proves cost-effective and can help optimize resources, particularly when they are limited.

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[56] NetherlandsHS06.

[57] EEAHS08.

[58] UNHabitatHS13.

[59] NetherlandsHS28.

[60] WFEOHS30, WFEOHS31.

104. **Access to robust, context-specific climate and other scientific data and information is important.** Such access could be improved by securing a partnership with or dedicated support from national institutions such as national meteorological services.[61]

105. **The co-production of knowledge** is effective only when supplemented with effective training, ongoing learning and the communication of results and outcomes to the knowledge holders.

106. Having a **leader to drive adaptation actions forward**, such as the mayor or governor or an expert, helps create trust and build the credibility and social acceptability of such actions.

107. Some considerations in achieving overall resilience of human settlements include:

(a) Ways to enhance adaptive capacity and reduce vulnerability of the most exposed population in the settlement;

(b) Innovative low-cost prototypes of adaptive measures leveraging local knowledge and resources;

(c) Economic incentives for local communities as part of the adaptation solutions.

5. Challenges and possible ways to address them

108. One challenge that is faced is **a gap between research output and the operational needs of users**; for example, a lack of research output or a lack of access to climate data or information can limit users such as urban planners in developing 'climate-proof' plans and integrating climate considerations in adaptation planning processes.[62] The Vulnerability Assessment Tool to Build Climate Change Adaptation Plan, developed by the Ministry of Environment of the Republic of Korea, provides information on the impacts of climate change for different sectors, and is intended to be used by local governments in establishing climate adaptation plans.[63]

109. **The poorest populations in rural or urban settlements are often the most exposed or vulnerable to climate hazards** owing to, for example, the proximity of low-income settlements to areas prone to flood such as floodplains or the location of slums in densely populated inner city areas with poor air quality. An effective adaptation response should address the adaptive capacity of these populations and reduce their socioeconomic vulnerability in order to be effective in the overall context of enhancing resilience in and of human settlements.[64] There is also a need for the inclusion of expropriation of land and compensation schemes for the affected communities (e.g. those affected by periodic flooding) in the overall adaptation package, which could be financially challenging.[65]

110. Although participatory decision-making that is decentralized to the lowest accountable level is effective in adaptation planning processes, devolution of powers to local actors or local institutions is not always fully matched by adequate transfer of technical knowledge or access to financial resources.

111. **Lack of adequate financial resources** can be a limiting factor in implementing hard adaptation solutions or scaling up successful prototypes. In the case of widening the River Waal in the Netherlands to allow more room for periodic high river discharge, the

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[61] WFEOHS30.

[62] EEAHS08, KoreaHS07, NorwayHS02.

[63] KoreaHS07.

[64] UCCRNHS11.

[65] EEAHS23.

financial challenge was partially addressed through securing additional funding from the affected provinces, water boards and municipalities.[66]

112. **Creating a network of stakeholders that can sustain adaptation action takes time.**[67] The speed at which measures are implemented depends on operational procedures, protocols, institutions and people. For example, setting up the network in the Amsterdam rainproof project took longer than the two years originally envisaged because of the complexity of connecting experts from different sectors, disciplines and locations within the Netherlands.

G. Case studies addressing water resources

1. Overview

113. Recognizing the intrinsic linkage between inland and non-inland water resources and other sectors and ecosystems, the sensitivity of the water cycle to climate-related changes and the great challenges in using climate models to project such changes, and the longevity (decades to centuries) of water management interventions, the case studies addressing water resources highlighted that climate change increases the vulnerability of water resources. Both availability and accessibility (quantity) and degradation (quality) of water resources are affected by climate change, leading to adverse impacts on ecosystems and biodiversity; agriculture and food security; land use and forestry; water supply and sanitation; health; and urban settlements and infrastructure. Impacts on regional water availability and accessibility could lead to regional water crises, resulting in economic destabilization and conflict, which would affect poor and vulnerable people the most.

114. Climate-related hazards affecting water resources that were reported in the case studies include:

(a) Changes in run-off in major river basins, with inter-seasonal disparities leading to increased run-off during rainy seasons and water shortages in dry seasons, affect livelihoods across the river basins. Glacial lake outburst floods released from temporary glacial lakes can cause mudflows and floods and, in mountainous regions, avalanches, landslides and rockfalls or, in the other extreme, reduced water availability. Increase in run-off and flooding causes degradation of water quality, mostly due to the increase in the load of nutrients and pesticides. Many case studies addressed drought (36) and flood (36) as key climate hazards;

(b) Sea level rise, altered frequency and intensity of precipitation, increased water temperature and more intense storm events affect estuaries and coasts. In turn, this affects the health of coastlines, including the people and species that inhabit them.

2. Tools and methods

115. Available and implemented tools and methods reported in the case studies are related to:

(a) Assessing current and future vulnerability;

(b) Planning, identifying and appraising options for adaptation;

(c) M&E.

116. A range of methods and tools for assessing current and future vulnerability was reported in the case studies. These include top-down approaches based on hydrological and

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[66] EEAHS23, EEAHS29.

[67] NetherlandsHS28, NetherlandsHS06, SEIHS19, WFEOHS30, WFEOHS31.

socioeconomic analyses at the basin-scale and bottom-up approaches to vulnerability assessment, including consideration of system limits that serve as a means of framing uncertainties about future climate projections and that are informed by local and indigenous knowledge.

117. In regard to planning, identifying and appraising options for adaptation, guidance and risk-informed decision frameworks were reported for determining the threshold of infrastructure, energy, agriculture, water supply and ecosystem sectors, as they are relevant in relation to climate risk to water resources (e.g. flooding). Inclusive and iterative processes for planning and appraising adaptation options, including the assessment of priorities and trade-offs, is key to designing successful context-specific adaptation interventions and avoiding potential maladaptation.

118. Examples of M&E frameworks included iterative processes for assessing and amending plans and actions thereby facilitating adaptive management approaches, participatory monitoring processes and the promotion of measureable evidence-based indicator systems.

3. Good practices

119. The case studies identified good practices for adaptation processes and structures conducive to stakeholder engagement, and for facilitating the various steps in the adaptation planning process, which is summarized below.

120. **The effective alignment of national and local institutions, policies and plans facilitate the identification and integration of effective responses to climate-induced hazards**. In Costa Rica, in order to prepare communities for and build their resilience to flooding, the Costa Rica Early Warning System for Hydrometeorological Hazards Project developed an effective structure for implementing an operating early warning system in the Sarapiqui River basin. The project involved strengthening coordination and cooperation between the National Meteorological Institute, the Costa Rican Institute of Electricity, the National Commission for Risk Prevention and Emergency Response and the surrounding communities. It also involved the strengthening of local capacity for the prevention of and response to flood hazards.[68] In Ghana, aligning the Water, Climate and Development Programme with the national strategic development planning framework facilitated the recognition of water security and climate resilience at the sectoral and subnational planning levels.[69]

121. **Recognizing the transboundary nature of water resources affecting communities from different countries and regions at all levels, an inclusive and structured process to engage stakeholders at the lowest accountable level helps to manage conflict and promote ownership of adaptation interventions:**

(a) **A mix of top-down and bottom-up measures (from the transboundary or international level to the regional, national and local levels) is a viable solution when developing an adaptation strategy addressing transboundary water resources**. When an adaptation strategy was developed for the River Rhine, measures built on planned frameworks at national and international levels (e.g. implementation of the European Union water framework directive and the European Union floods directive as well as the Action Plan on Floods from the International Commission for the Protection for the Rhine (ICPR), in effect since 1998).[70] The summit of the Danube heads of state was essential for generating commitment to and leadership for the Lower Danube Green Corridor agreement, while regional institutions, particularly the European Union and ICPR, were crucial in promoting reform, benchmarking practice and sharing knowledge of successful practices;[71]

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[68] CostaRicaW01.

[69] GWPW24.

[70] ICPDRW12.

(b) **Bilateral frameworks and directives could provide the necessary political will and help in accessing financial resources**. The water treaty between Mexico and the United States of America has provided a stronger mandate for the National Water Commission of Mexico (CONAGUA, Comisión Nacional del Agua) to intervene in the Rio Bravo (Rio Grande) basin shared by these two countries, and the treaty has also enabled access to finance from the North American Development Bank. WWF and the Fundación Gonzalo Río Arronte IAP have formed partnerships as 'boundary organizations' and facilitated flows of knowledge through translating scientific information into policy and practice from the local to international scale.[72]

122. **Inclusive and iterative processes for planning and appraising adaptation options, including assessment of priorities and trade-offs, are key to designing successful context-specific adaptation interventions and avoiding potential maladaptation**:

(a) As a part of an assessment study conducted in the drought and flood prone areas of the Ganges River basin, adaptation effectiveness indicators were identified using a multi-criteria decision-making methodology whereby communities prioritized effective adaptation options in a participatory manner.[73] Another example of an inclusive process is the National Integrated Drought Information System (United States), which involved the coordination of scientists across the physical, natural and social sciences, water resources professionals across scales of decision and action, and preparedness communities across the country in order to produce a prototype mechanism for developing early warning information for proactive drought risk reduction;[74]

(b) Considering priorities and trade-offs when appraising adaptation options helps in selecting optimal interventions. For example, building infrastructure such as sea walls could adversely affect wetlands by preventing sediment transport essential to that ecosystem. Considering this trade-off, the New Jersey Coastal Blue Acres land acquisition programme acquired coastal lands that were damaged or prone to damage by storms in order for these lands to provide a buffer for other lands, as well as providing space for recreation and conservation;[75]

(c) An iterative process of mutual learning, participatory techniques and a bottom-up approach ensure that stakeholders play an active role in determining appropriate strategies for the management of river basins. The BeWater Project used methodologies integrating physical, ecological, social and management processes to develop water management options for four case study river basins across the Mediterranean. These options are discussed with local communities who participate in preparing locally relevant adaptation plans that may be scaled up to develop guidelines of national and international relevance.[76]

123. **Public–private partnerships could help ensure success with a decentralized decision-making process**. The Manila Water Company in the Philippines, through decentralized decision-making and target-based systems, was successful in promoting personal accountability and institutionalizing values of integrity and customer centricity. These values in turn promoted climate-resilient service improvements and helped to create

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[71] WWFW47.

[72] WWFW51.

[73] IGESW02.

[74] USAW20.

[75] USAW15.

[76] StudioW09.

a strong brand.[77] Private sector involvement is important in demonstrating profitability of adaptation activities to local communities.[78]

124. **Innovative financial systems trigger cost-effective solutions**. In order to maintain water availability under growing demand, adaptation options must either free up additional water sources or reallocate water distribution; for example, through the creation of water markets. The Metropolitan Water District of Southern California has created a water market that compensates landowners and agencies for irrigating less land.[79] A permanent financial mechanism through local institutionalization – where downstream water users pay into a fund, often through their water bills, that finances incentives for upstream landowners to conserve land – is another useful example of how to secure watershed protection investment in the long term.[80]

125. **Inclusive, interdisciplinary, systematic assessments of climate change impacts and analyses of future climate risks to water resources help decision-making on adaptation interventions with socioeconomic and environmental considerations**.

(a) The Alliance for Global Water Adaptation (AGWA) methodology is a good example of a systemic bottom-up approach to water resources planning under climate change;[81]

(b) Another example of such good practices is the analysis of future risk of flooding for the Magdalena River basin in Colombia, which was performed using multiple plausible future projections of climate, findings from expert workshops and literature searches (inputs to land use and water demand), downscaling and hydrological modelling tools, and water allocation models (to explore future water shortages). Socioeconomic scenarios were developed together with local stakeholders, authorities such as national and regional governments and water management authorities, and sectoral representatives from the ministries of agriculture, environment, planning, energy and mining. The necessary modelling tools were developed and validated. Training was provided, the software was made available and detailed reports were made public.[82]

126. Decision-making for the planning, design, financing and operation of water infrastructure is often made under conditions of great uncertainty. **Investments in water infrastructure need to consider both current and future risks at all stages of development if the infrastructure is to be robust and resilient to climate change**. AGWA is developing and testing its Decision Support System, which focuses on infrastructure and institutions. Components of the system are being implemented in 20 pilot programmes globally, engaging water resource managers, utilities, governments, the private sector and international non-governmental organizations.[83]

127. **Co-production of knowledge leads to locally appropriate, cost-effective adaptation solutions**. Demonstration projects have been essential in confirming the benefits and inspiring wider adoption and scaling up. The tank restoration project of the Better Cotton Initiative succeeded because work with the villages was led by their demand, respected their needs, utilized locally available technologies and provided immediate benefits.[84] The Ouranos water management programme in Canada demonstrated that co-construction with the communities affected by the climate change impacts ensured better

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[77] UCCRNW33.

[78] WWFW49.

[79] USAW15.

[80] RareW22.

[81] UNECEW13.

[82] UNESCO-IHEW04.

[83] AGWAW05.

[84] WWFW51.

results because the options proposed targeted the sources of vulnerability identified by all project partners.[85] A ‘springshed’ development project was implemented in Nepal for reviving springs, leading to better water supply and healthier ecosystem services. Women and marginalized groups were engaged in the project.[86]

128. **Strengthening local adaptive capacity to sustain livelihoods is a useful entry point to meaningful engagement of communities on water security.** In the AdaptCap pilot project for the installation of a water treatment plant in the village of Desaraju Palli, India, the community was involved in the project’s development and assessment after training in climate change and adaptation. The community contributed to the operation and maintenance of the treatment plant, and the local and state governments came forward to replicate and expand on work done.[87]

129. **Livelihood diversification solutions inspire local commitments and actions to resilience.** Nature Seekers was established with the aim of protecting the nesting ground of sea turtles along Matura Beach in Trinidad and Tobago. This was the first co-management model developed between community members and the Forestry Division of Trinidad and Tobago for sea turtle conservation where the community sustainably benefited from the natural resources. The Nature Seekers model has been applied to adjacent similar watersheds where the community is included in both conservation and business initiatives.[88]

130. The following good practices for M&E have emerged:

(a) **An iterative adaptive process is a key to assessing and amending plans and actions in the light of future climate risks and information.** The climate change adaptation strategy for the Danube basin (Central and Eastern Europe) provides a good example, where the river basin and flood risk management plans are updated based on a six-year planning cycle, allowing for adaptive management of the basin by taking into account new information on climate risks.[89] In the Netherlands, pilot projects of innovative technological interventions to ensure the availability of freshwater supply at farm level in time and of appropriate quality and quantity were carried out. Monitoring of the hydrogeological performance of the three projects will be extended (to 2015–2017) in order to evaluate how the technologies perform under variable climatic conditions;[90]

(b) **Participatory monitoring of adaptation interventions is a key to maintaining the adaptive capacity of communities.** Participatory M&E of conflict situations exacerbated by climate change in North Darfur provides a good example and has resulted in improved community resilience and adaptive capacity. Peace Committees hold weekly or biweekly meetings to continuously monitor natural resource use and resource-based conflicts in their local areas, and use this information to resolve or avoid further conflict, thereby maintaining the adaptive capacity of the communities;[91]

(c) **An evidence-based system with measurable indicators is an effective way to monitor the progress of adaptation interventions and scale up good practices.** Recognizing that reform of agricultural water management is key to achieving sustainable water use and reducing the vulnerability of rural communities, WWF is developing and applying better management practices in cotton production. WWF work in the Godavari River basin in India involves 20,000 cotton farmers in a demonstration project to test the

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[85] OCW35.

[86] ICIMODW16.

[87] AdelphiW40.

[88] Trinidad&TobagoW43.

[89] ICPDRW11.

[90] NetherlandsW14.

[91] PracticalActionW37.

Better Cotton Initiative's global sustainability model. The initial tank restoration project tracked a range of costs and benefits, establishing the case for broader public investment.[92]

4. Lessons learned and factors that influence success

131. A number of factors that influence success have emerged as crucial for adaptation planning **addressing transboundary water resources**:

(a) A sound legal and institutional framework for transboundary cooperation and a governance system that can learn and anticipate shifting needs and conditions;

(b) A shared scientific knowledge base for joint decision-making;

(c) A clear political mandate and commitment, enabling administrations, experts and stakeholders to work collaboratively.

132. The following lessons have emerged in relation to **assessment and planning adaptation options**:

(a) Intersectoral coordination is an important criterion for success given the interlinkage of water resources with other sectors;

(b) Creating flexible decision pathways, developing adaptive governance systems, and incorporating bottom-up approaches to vulnerability assessments and both ecological and engineering views on resilience help overcome the uncertainties of climate change and enhance the resilience of long-lasting water infrastructure;

(c) It is important to consider the optimal mix of both bottom-up approaches to vulnerability assessment, which reflect inherent system limits and serve as an effective means of framing uncertainties about future climate projections, and top-down methodologies, which rely heavily on climate models to frame vulnerability;

(d) It is important to consider flexible decision pathways that use economic analytical methodologies to estimate the costs of maintaining multiple options and evaluate trade-offs between waiting for more certain information before implementation versus acting in the short term with less information. Tank restoration work of the Better Cotton Initiative in India shows how building community capacity, applying technologies that are locally available and profitable for communities, and undertaking small-scale measures can add up to effective and inexpensive large-scale and pro-poor climate change adaptation.[93] Such an approach contrasts with the negative consequences of large water infrastructure in terms of cost, constraints on scaling up implementation, displacement of people, limited capacity for village self-determination and substantial environmental impact;

(e) A full assessment of possible interventions, including their effects on the economy and on environmental quality, is recommended so that adaptation options are socioeconomically viable. Furthermore, it is useful to integrate both engineering (hard infrastructure) and ecological (dynamic social-ecological systems) perspectives and approaches to resilience. Water management and infrastructure decisions should not externalize the environmental and social impacts during the decision-making process;

(f) It is important to consider innovative local level financing and revenue options to secure long-term and sustainable investments.

133. **Capacity-building** should be an inherent and one of the initial components of the adaptation planning process, in particular to ensure the success of innovative technological interventions at the community level.

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[92] WWFW49.

[93] WWFW48.

134. Key lessons learned in relation to **the importance of local institutional knowledge and co-production of scientific and local knowledge** are:

(a) Creating a learning environment in the form of a 'living lab', where stakeholders and scientists have the opportunity to explore adaptation measures by dialogue, experiment and fieldwork, is beneficial;

(b) Focusing on recent events and stakeholder knowledge, and moving beyond discussions on uncertainty, help shift the discussion of climate change adaptation from research-based towards action-oriented solutions;

(c) Connecting science and practice over the long term involves sustained communication and building trust through partnerships with the people who live in the affected communities and ensures that resources are directed towards existing institutions.

135. The following factors have emerged as important for successful **provision and dissemination of knowledge:**

(a) The production of good science is important but the communication of study results and the tools developed is crucial and needs to be tailored to stakeholders and audiences;

(b) The development of localized science is crucial in order to draw attention to the local impacts of climate change at the regional level.

136. Specific lessons learned in **M&E**:

(a) A cyclic adaptive approach is helpful to deal with uncertainty, with updated assessments and targeted amendments to existing measures based on new information;

(b) Functional observations and monitoring systems are essential, not only to inform scientific assessments but also to provide a consistent and reliable source of information;

(c) Both climate change risk reduction and economic performance need to be incorporated into M&E frameworks to determine the progress of adaptation interventions and the investment required.

5. Challenges and possible ways to address them

137. The case studies identified challenges in addressing adaptation actions related to transboundary water resources:

(a) Transboundary water resources management often requires a strategic roadmap with **political will and financial commitment** of the countries sharing the water resources. There is a need for joint scenarios, modelling and vulnerability assessment, but the extent of harmonization could be limited by resources and time;

(b) Building networks and collaborative partnerships that effectively connect knowledge holders can be challenging because it requires an investment of time;

(c) There is a need for capacity-building in adaptation among relevant sectors and continuous intersectoral communication and coordination.

138. **A lack of or limited funding often becomes a barrier to harmonizing national and subnational policies and implementing adaptation interventions. Collaborative partnerships can help address such challenges.** Collaborative partnerships of non-governmental organizations, funders, government agencies and researchers have yielded success in the sharing of resources and expertise to help improve watersheds.

H. Case studies addressing health

1. Overview

139. The case studies addressing health highlighted that climate change exacerbates the environmental determinants of health, such as through its risk to water resources, infrastructure and sanitation, hence posing a serious health risk to societies, especially their vulnerable groups (e.g. the elderly, infants and young children, chronically ill people and people who work outdoors).

140. The case studies reported that climate-related hazards affecting health include:

(a) More frequent and intense extreme weather events such as floods, cyclones and droughts, shifting weather patterns and extreme heat (such as heatwaves) increase the risk of disease and death related to such hazards;

(b) Sea level rise, seawater intrusion and coastal inundation can provide new breeding grounds for mosquitoes, increasing the risk of waterborne diseases such as dengue fever and malaria. Sea level rise was reported as a key climate hazard in seven case studies;

(c) Drought leads to the more common occurrence of nutrition-related diseases. Drought was reported as a key climate hazard in 10 case studies.

2. Tools and methods

141. Examples of tools and guidance for assessing the current and future vulnerability of health to climate change include an assessment tool that uses a combination of qualitative and quantitative methods to assess the impacts of climate change on a range of climate-related health concerns[94] and an information guide on the health impacts of climate change.[95]

142. Examples of planning, identifying and appraising options for adaptation include a tool for estimating health and adaptation costs for Europe,[96] guidance to include climate-sensitive health risks into NAPs,[97] and a methodology aimed at strengthening the adaptive capacity of national health institutions, including field practitioners, to respond to climate-sensitive health risks.[98]

143. Two examples were reported for M&E, with both emphasizing the usefulness of an iterative adaptation planning process. A vulnerability reduction assessment tool was applied in Bangladesh, Ethiopia, Nepal and the United Republic of Tanzania for defining and guiding the implementation of climate-resilient health policies in water, sanitation and hygiene at the national and local levels. The tool guides an iterative risk management process that sets a health vulnerability baseline in relation to climate change and monitors progress of the adaptation action by assessing how the baseline has changed over time.[99] The Building Resilience Against Climate Effects (BRACE) framework helps the 18 States of the United States using it to develop and implement health adaptation plans and address gaps in critical public health functions and services through an iterative process.[100]

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[94] WHOH03.

[95] UNITARH11.

[96] EEAH04.

[97] WHOH03.

[98] WHO/UNDPH05, WHO/UNDPH06, WHO/UNDPH07, WHO/UNDPH08, WHO/UNDPH09, WHOH10.

[99] WHOH01.

[100] USAH02.

3. Good practices

144. Good practices for processes, structures and approaches that are conducive to stakeholder engagement and good practices that facilitate the steps in the adaptation process have been reported in the case studies.

145. Considering the interlinkages and interdependencies of health with other sectors, such as transport, energy, water resources, food security and agriculture, and human settlements, **robust multisectoral mechanisms engaging interdisciplinary stakeholders at the national and subnational levels are conducive to building health systems that are resilient to climate change**. These mechanisms also help in cost sharing of the actions and promoting health co-benefits of actions in other sectors. The smooth functioning of the heatwave early warning system in China, for example, relied on effective coordination between the health, meteorological and educational institutions.[101]

146. **Inclusive processes that engage local and indigenous people often help secure ownership and develop and strengthen local institutional capacity in delivering results in meaningful and locally appropriate ways:**

(a) In Ghana, the United Nations Development Programme (UNDP) engaged local indigenous people in project activities where traditional practices can help educate the members of the district-based-inter-agency committee on climate change and health. Community health volunteers from indigenous and local communities serve the health needs of community members and report on emerging diseases using a community health register;[102]

(b) Inuit and Northern First Nation communities are undertaking projects that meet the needs and priorities of their communities in a meaningful and locally appropriate manner and have a culturally respectful approach. Research moves from a community-based to a community-led framework, resulting in a community's capacity to respond quickly to research questions and needs that emerge and to actively create evidence-based health adaptation strategies to respond to the challenges of a rapidly changing climate.[103]

147. **Innovative and flexible funding structures help decentralize engagement to the lowest accountable level.** Health Canada's Climate Change and Health Adaptation Program (CCHAP) is an innovative funding structure that fosters, supports and mobilizes community-led climate change and health adaptation research in First Nation and Inuit communities across the north of the country. The programme allocates nearly 85 per cent of funding to community-driven research through a competitive process. A selection committee made up of community members approves proposals and decides how best to allocate funds to suit the needs of communities.[104]

148. **Co-production of scientific, local and indigenous knowledge is effective in responding to community needs and priorities.** CCHAP supports a community–scientist interface for knowledge exchange and joint validation and multi-stakeholder dialogues in order to gain institutional support, mainstream traditional knowledge and practices in adaptation measures, and develop action plans that are more responsive to community needs and priorities.[105]

149. **Developing and disseminating evidence of health benefits (e.g. reduced health impacts, reduced health-care costs) and co-benefits to other sectors (e.g. water security) from adaptation actions could help build local and political ownership of**

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[101] WHO/UNDPH06.

[102] WHO/UNDPH12.

[103] CanadaH13.

[104] CanadaH13.

[105] CanadaH13.

such actions addressing health. An adaptation project in Barbados treating wastewater to be used for recharging aquifers and for irrigation is expected to demonstrate a reduced incidence of dengue fever while increasing water safety and availability and public acceptance of treated wastewater for non-potable use.[106]

150. **Integration of climate-related health risks into existing national and sectoral plans and policies is conducive to developing health systems that are resilient to climate change**. The National Heat-Health Action Plan for the former Yugoslav Republic of Macedonia was developed within the National Strategy for Adaptation for the health sector to implement adaptation measures and prevent health consequences associated with extreme heat due to climate change.[107] Ongoing work of the World Health Organization (WHO) to support its member States[108] in developing the health component of their NAPs is a good example of the consideration of health in an adaptation planning process at the national level.[109] In Samoa, public health plans and strategies have been revised to incorporate climate risk projections and adaptive planning.[110]

151. **Documenting and disseminating information and knowledge on health impacts of climate change, health-related vulnerability and adaptation assessments, and adaptation plans and actions provide an important knowledge base and a helpful basis for scaling up and scaling out good practices**. The resource guide for advanced learning on understanding the climate change and health interface developed by the One UN Climate Change Learning Partnership (UN CC:Learn), with technical inputs from WHO, is a good example. The development of 'community of practice' groups for both geographical regions and climate and health topics has allowed exchange of information and best practices among stakeholders.[111]

152. The following good practices for M&E have emerged:

(a) **Setting attributable indicators for a baseline helps to evaluate the progress of an adaptation intervention. One effective indicator is a reduction in health impacts**, as in the case of the vulnerability reduction assessment tool used in Bangladesh, Ethiopia, Nepal and the United Republic of Tanzania for defining and guiding the implementation of climate-resilient health policies in water, sanitation and hygiene at the national level;[112]

(b) **Inclusive, participatory processes that engage local and indigenous communities also strengthen the evaluation process**. In Fiji, community visits were often undertaken to disseminate key assessment findings and to develop a community map and a seasonal calendar at each pilot site. Community members were able to identify and prioritize areas of need in relation to climate change; showing increased knowledge on the impact climate change has on health.[113]

153. **Frameworks and processes with anticipatory and iterative components allow the evaluation and improvement of activities**. The BRACE framework is a good example in this regard (see para. 143 above).[114]

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[106] WHO/UNDPH05.

[107] EEAH04.

[108] All 58 member States in the African and South-East Asian regions, 32 in the Region of the Americas, 12 in the European Region, 8 in the Eastern Mediterranean Region and 14 in the Western Pacific Region.

[109] WHOH03.

[110] WHO/UNDPH12.

[111] USAH02.

[112] WHOH01.

[113] WHO/UNDPH12.

[114] USAH02.

4. Lessons learned and factors that influence success

154. The case studies reported a number of key factors that enable effective response actions in addressing the health risks related to climate change.

155. The vulnerability and adaptive capacity of communities will evolve over time as the climate changes and more is understood (i.e. more data become available and are validated) about the relationship between climate and health determinants and outcomes. Thus **the policy and planning process will benefit from iterative learning, assessment and understanding of the needs and capacity of communities to respond to climate-related health risks and the relevance of interventions**.

156. Recognizing the pivotal role of national and local institutions in addressing climate-related health risks, it is imperative to **enhance their understanding of the links between climate change and health and to strengthen their capacity** in technical areas, such as in early detection and adequate response and in anticipating the consequences of emerging diseases related to climate change.

157. **Traditional and scientific knowledge systems must work in tandem,** while respecting diverse values, and build on respective strengths in order for communities and governments to develop adaptation plans that reduce environmental and health risks to ultimately save lives.

158. The complex interlinkages between health and other sectors necessitate the **engagement of multisectoral and interdisciplinary stakeholders** at the national, subnational and community level. Such engagement is most successful when initiated at a very early stage of the process.

159. Pilot adaptation interventions in areas of heightened health risk need to be documented and analysed to enable them to be scaled up and scaled out.

160. **Integrating climate-related health risks into national and sectoral strategies and policies** is an effective approach to ensure that these risks are considered when making decisions. However, it is also important to consider funding implications and ensure that sufficient funds are available for implementation of the strategies.

161. Climate hazards disproportionately affect the health of high risk and vulnerable groups (related to socioeconomic factors) in the community. It is important therefore to **consider priority actions for these groups**.

162. Investment into technology-based solutions can exponentially increase the capacity of the health sector to respond to climate variability. An example is the supply of telecommunication equipment (such as mobile phones) in Ghana, which led to increased health-care delivery to communities in climate-sensitive environments within the periphery of the pilot districts, that bear significant burdens of disease related to climate change.[115]

5. Challenges and possible ways to address them

163. A lack or limited understanding of how climate change impacts health is often a barrier to developing climate-resilient health plans and actions at different levels.

164. While there is increasing recognition of the role of traditional knowledge in adaptation, it is mainly concentrated in the early stages of the adaptation process – primarily in observation and assessment. The uptake of traditional knowledge, capacity enhancement and focused engagement needs a time commitment and resources to develop and scale up. Most funding programmes are one-offs that do not allow communities to build momentum, capacity and critical mass for addressing the inclusion of traditional

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[115] WHO/UNDPH12.

knowledge. The CCHAP innovative funding model (see paras 147 and 148 above) demonstrates how traditional knowledge can be successfully incorporated into the design, planning and delivery of adaptation plans.[116]

165. The outcomes and outputs of projects often focus on adaptation in the short term. While this is appropriate and necessary given the data collection and reporting in many countries, it is also important to place the national project activities in the context of an iterative risk management approach to the health risks of climate change. As early warning systems are implemented, it could be helpful to engage in discussions of how often the system should be re-evaluated to determine whether thresholds, timing and responses remain relevant or should be flexible in a changing climate.

166. Technology is critical to building resilience to climate change in the health sector. Funding limitations can, however, mean the most optimal solutions, which are often technological, cannot be implemented.

167. Many countries have health delivery systems but lack the capacity and knowledge needed (including by field practitioners) to respond to climate change. Some initiatives undertaken by WHO and UNDP have been helpful in addressing the challenge by facilitating access to national or international experts and providing support material for national vulnerability and adaptation assessments and vulnerability reduction assessments.[117]

168. The case studies highlighted the limited national and international investment in the health sector for responses to climate change, despite the cost savings that adaptation measures would bring. For example, during the development of the National Heat-Health Action Plan in the former Yugoslav Republic of Macedonia, the WHO tool to estimate health and adaptation costs highlighted the importance of adaptation by showing that annual heat-health adaptation measures would be approximately 12 million of the former Yugoslav Republic of Macedonia denars (MKD) compared with the health damage costs without adaptation of MKD 170 million.[118]

I. Processes and structures for linking national and local adaptation planning

1. Overview

169. The 17 case studies with a key focus on linking national and local adaptation planning reported on a range of processes and structures that facilitate such linkage. Examples include processes and structures for assessment (2),[119] planning (14)[120] and implementation (5).[121] Several case studies addressing the four thematic areas discussed in chapters II.E–H also reported on good practices related to processes and structures for linking national and local adaptation planning (24 of those addressing ecosystems,[122] 15

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[116] CanadaH13.

[117] WHOH03, WHOH10, WHO/KenyaH14, WHO/UNDPH05, WHO/UNDPH06, WHO/UNDPH07, WHO/UNDPH08, WHO/UNDPH09.

[118] EEAH04.

[119] RussiaL17, UNESCWAL15.

[120] LundL04, ChileL10, IUCNL03, KenyaL02, KenyaL01, KoreaL12, KoreaL06, NorwayL08, NepalL11, NorwayL14, CATIEL09, SwedenL07, UNDPL05, USAL13.

[121] KenyaL01, KenyaL02, NorwayL08, NepalL11, SwedenL07, UNDPL05.

[122] BirdLifeE18, BlueVenturesE42, AERIE46, CanadaE13, CanadaE03, CAREE26, CFIE44, EcuadorE02, ILOE06, IUCNE15, IUCNE19, IUCNE23, IUCNE47, IUCNE05, PracticalActionE31, IUCNE38, CATIEE09, UgandaE37, UNDPE01, UNEPE11, USAE50, USAE24, WMOE30, WWFE51.

health,[123] 13 human settlements[124] and 15 water resources[125]). The good practices and lessons learned discussed in this chapter are derived from all relevant case studies.

170. Linking national and local adaptation planning is particularly relevant and important for the following reasons:

(a) Climate change significantly affects people, especially those whose livelihood depends on natural resources. The health impacts of climate change on individuals and communities are determined at the local level by changes in local conditions and health behaviours as a result of available information. Resilience can be strategically built through good development policies and practices that take climate change into consideration and empower communities. For example, timely and improved access to climate-related information by local people (e.g. farmers) that helps them to plan agriculture systems which are resilient to climate change significantly depends on a decentralized system of national meteorological services;

(b) Climate-related hazards affect natural, social and economic functions of ecosystems and the communities that are part of these ecosystems. Future climate variability and change, and its associated uncertainty, as well as the interconnectedness of systems and sectors at different levels, provides a strong case for inclusive and flexible planning processes;

(c) Climate-induced hazards have different impacts on populations and the groups within them. Vulnerable groups, such as women, children, the elderly and indigenous people, are at significant risk. National planning processes should be responsive to the needs and capacities of vulnerable groups;

(d) A robust response to climate risks and impacts requires a strong link between national policies and planning, where many of the resources, expertise and personnel for risk management are concentrated, and local planning, where communities are forced to become first responders to impending hazards;

(e) The effectiveness of adaptation is highly context dependent. Without understanding the local context, national plans will not have the desired impact. If community members are more educated and aware of the issues and solutions related to climate change in their immediate ecosystem and the way it affects them specifically, they will be more likely and willing to participate in conserving the ecosystem and be more receptive to the implementation of projects in their communities.

2. Tools and methods

171. The case studies provide various examples of institutional frameworks and processes for planning, identifying and appraising options for adaptation as well as for implementing adaptation actions. The examples include plans and guidelines in support of decision-making on adaptation and mainstreaming climate change adaptation into development and sectoral policies and plans at different levels.

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[123] CanadaH13, EEAH04, WHO/KenyaH14, USAH02, WHOH01, WHOH03, WHOH10, WHO/UNDPH15, WHO/UNDPH05, WHO/UNDPH06, WHO/UNDPH07, WHO/UNDPH08, WHO/UNDPH09.

[124] EEAHS29, EEAHS23, IUCNHS17, KenyaHS14, KoreaHS07, NetherlandsHS28, NetherlandsHS06, NorwayHS02, SEIHS19, UNHabitatHS15, UNHabitatHS24, WFEOHS30, WFEOHS31.

[125] CanadaW39, CostaRicaW01, UNESCO-IHEW04, GWPW19, GWPW23, GWPW24, GWPW25, GWPW38, IGESW02, MexicoW29, TNCW28, USAW15, WWFW50, WWFW47, WWFW49.

3. Good practices

172. Several good practices have emerged in regard to stakeholder engagement and various processes and structures that facilitate linking national and local adaptation planning.

173. **Strengthening national and local institutional frameworks catalyses transformational change and helps to replicate good practices**:

(a) The Local Adaptation Plans for Action (LAPAs) in Nepal comprises a plan and a set of prioritized adaptation interventions. Led by the Ministry of Science, Technology and Environment of Nepal, LAPAs have been implemented through institutional structures at different levels: district development committees (responsible for implementing and integrating adaptation into development and planning processes); line agencies (responsible for sectoral planning and providing resources and expertise to execute the LAPAs); and community user committees (responsible for fostering local ownership of adaptation interventions);[126]

(b) The Local Governments and Climate Change Initiative in Cambodia is another example of a strengthened institutional framework at the local level. The initiative fostered the role of local governments in identifying practical ways to mainstream resilience to climate change into subnational planning and finance systems;[127]

(c) The Korean Ministry of Environment supported local governments in developing local adaptation plans, at both the provincial and the community levels, through provision of guidelines, case studies, consultations and workshops.[128]

174. **The provision of funding or direct access to funding facilitates the linkage of local and national adaptation planning**. The Country Adaptation Fund Model used in Kenya engaged vulnerable community members through adaptation planning committees in prioritizing resilience-building activities against predetermined criteria for funding. The inclusion of community members in the allocation process not only recognized the value of local knowledge and fostered local ownership, but also recognized the community institutions established as a part of this process as legitimate agents for development that engage constructively with county government structures and processes.[129]

175. **Integrating climate change adaptation considerations into sectoral and development planning processes of local bodies and governments helps to strengthen the linkage between local and national adaptation planning**. The IUCN developed a Climate Change Gender Action Plan in Mozambique through a multisectoral and multi-stakeholder process that facilitated the identification of gender-sensitive adaptation actions at both national and local levels.[130]

176. **Promoting co-production of knowledge through an inclusive, multidisciplinary and structured process provides a strong impetus to harmonize top-down and bottom-up approaches and such processes also enable consideration of the multisectoral dimension of climate change in adaptation actions**:

(a) The establishment of Climate Science Centers (CSCs) is an example of a successful government–university partnership from the United States. CSCs enable access to skills, expertise, facilities and other resources at both national and local levels. CSCs include a stakeholder advisory committee of federal, state and tribal partners, which provide guidance and input on key management issues and priority scientific needs. Large-scale issues (e.g. drought, migratory species) that cross regions or are national in scope are coordinated through multi-CSC partnership activities, forming a multi-tiered science programme;[131]

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[126] NepalL11.

[127] SwedenL07.

[128] KoreaL06.

[129] KenyaL02

[130] IUCNL03.

(b) The Cities of the Future was a collaborative effort between the Government of Norway and the 13 largest cities in that country. The programme, carried out from 2008 to 2014, was led by the Ministry of the Environment, the Ministry of Local Government and Regional Development, the Ministry of Petroleum and Energy and the Ministry of Transport and Communications together with the Norwegian Association of Local and Regional Authorities and the business sector. Representatives of the cities were engaged in capacity-building related to knowledge of climate change, future climate change impacts in Norway and in the 13 cities in particular, and how the cities could face these changes with adaptation measures. The Cities of the Future was an important driving force for climate change adaptation in Norway and helped to speed up the climate change adaptation planning process in other municipalities;[132]

(c) The Global Framework for Climate Services adaptation programme was launched in Africa in 2012 as a partnership of climate service producers (i.e. national meteorological agencies) and users of climate information and services (i.e. priority sectors of agriculture, health and disaster risk reduction) to work together to improve the quality, quantity and use of climate and weather services in Malawi and the United Republic of Tanzania.[133] The programme serves to mobilize partners to implement the framework for climate services at the national level in order to improve cooperation, capacity and use of accessible and accurate climate services that can inform climate adaptation. In the health sector, where awareness of the link between climate and health was very low at the beginning of the programme, the initiative has significantly increased the dialogue between the meteorological agencies and the ministries of health in the target countries, allowing for improved use of climate information in health sector adaptation efforts in the future.

177. **Knowledge-sharing and learning at all levels and across multiple sectors is conducive to informing adaptation planning processes at national and local levels.** The report *Klimatsäkrat Skåne* (Climate-proofed Scania) developed for Scania (Sweden) is a good example of an interdisciplinary initiative that synthesized climate change information tailored to the regional context. Developed through collaboration between academia and regional authorities, the report is currently being used to inform deliberations in local and regional decision-making processes related to climate change adaptation, mitigation and overall regional development.[134]

178. In regard to **M&E**, a comprehensive framework that uses local indicators and can be aggregated to subnational and national levels could serve as an effective tool in assessing the overall aggregate impact of local actions at the national level, which can help to inform the evidence base. The Tracking Adaptation and Monitoring Development Framework in Kenya aggregated locally generated indicators to county and national levels for assessing overall impact.[135]

4. Lessons learned and factors that influence success

179. Improving **institutional capacity at all levels** enables innovative and effective institutional frameworks critical to linking national and local adaptation planning.

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[131] USAL13.

[132] NorwayL14.

[133] WMOL16.

[134] LundL04.

[135] KenyaL02.

180. It is essential to recognize and leverage **networks and partnerships** that already exist at all levels, to establish clear roles and responsibilities for the various governance levels (in particular local, subnational and national), and to set up flexible and well-coordinated institutional processes.

181. National governments need to strengthen efforts (including the allocation of resources) to **understand, share with communities and enhance knowledge on climate risks in order to support local level resilience to climate change.** Provincial and district government offices have a crucial role in bridging national policies and local implementation.

182. **Aligning activities in national and local processes** is a factor for success.

183. It is imperative to have **information and knowledge exchange** between all members of the community (including men, women and indigenous people), scientists and policymakers to inform the decision-making process and make it more inclusive.

184. Because climate change affects all members of society and can have complex and cascading impacts, it requires the concerted and coordinated efforts of both governmental and non-governmental actors to develop appropriate solutions. **Civil society networks and platforms** can strengthen the link between local and national level adaptation planning.

5. Challenges and possible ways to address them

185. **Capacity-building for effective adaptation planning and actions is necessary at all levels**. Chile, as part of its NAP, is planning capacity-building for public institutions and civil society to improve their understanding of climate change and how it will affect their personal lives and communities.

186. **A lack of existing structures or mechanisms at the national level could be a significant barrier to coordinating and scaling up local actions**. One of the main challenges faced in implementing climate service programmes by the World Meteorological Association is the lack of existing structures for coordinating efforts at the national level, compared with the well-established mechanisms for other sectors such as health. To ensure that these efforts achieve tangible results and lead to improved adaptive capacity there is a need for a more coordinated approach. Making a clearer link between climate services and climate change adaptation, engaging with the process to formulate and implement NAPs, and working with existing structures for climate change coordination can help address this challenge.[136]

187. The process to formulate and implement NAPs under the Cancun Adaptation Framework offers an important opportunity for countries to link national planning processes to local knowledge and experiences. However, specific guidance, measures and mechanisms are needed to link local experiences and national priority-setting processes.

J. Conclusions and next steps

188. Certain common elements have emerged on adaptation planning processes addressing ecosystems, human settlements, water resources and health, as well as on linking national and local adaptation planning. This chapter highlights these key common elements, including gaps in relation to the provision and dissemination of information and knowledge, which could be considered as a basis for possible next steps, in the context of the NWP.

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[136] WMOL16.

189. The findings in chapter II.E–I provide evidence of the links between ecosystems – at the level of species, genetic diversity within species and ecological interactions – and water resources, health and human settlements, hence supporting the notion that adaptation planning and practices are often cross-thematic and yield benefits in more than one thematic area. For example, there was recognition in the case studies of the role that healthy ecosystems play in increasing the resilience of communities and helping people to adapt to climate change through the delivery of a wide variety of services that help maintain human well-being. Human settlements also show evidence on the link with other thematic areas, including water resources, environmental services and health.

190. In regard to the integration of gender-sensitive strategies and tools and of indigenous and traditional knowledge, the following key messages have emerged:

(a) It is important to develop and use information and knowledge from all sources, including co-constructing traditional, local and contemporary scientific sources, recognizing cultural and gender sensitivities, and ensuring that all such information is gathered and validated, if possible, through a systematic process. Such co-construction processes help empower local communities, promote shared understanding of the issues and strengthen the capacity of communities to implement adaptation actions;

(b) Inclusive processes that engage all members of a community (including men, women and indigenous people) often help secure ownership and develop and strengthen local institutional capacity to deliver results in meaningful and locally appropriate ways. Hence, it is imperative to have information and a knowledge exchange among all members of the community, scientists and policymakers to inform the decision-making process and make it more inclusive.

191. Although some case studies provided examples of good practices, a number of gaps and challenges exist in relation to the provision, documentation and dissemination of information and knowledge, including on collaborative partnerships at multiple levels, for scaling up adaptation actions addressing the four thematic areas referred to in paragraph 51 above. Knowledge and information issues that would be useful for adaptation practitioners and policymakers to consider in the light of these gaps and challenges are as follows:

(a) It is crucial to disseminate the scientific findings of the local impacts of climate change at the regional level. While producing good science is important, communicating the results is essential. Communication tools are crucial and need to be tailored to stakeholders and audiences;

(b) Documenting and disseminating information and knowledge at all levels and across multiple sectors is conducive to informing adaptation planning processes at national and local levels. Documenting and disseminating information and knowledge on the impacts of climate change addressing various themes, vulnerability and adaptation assessments, and adaptation plans and actions provides an important knowledge base and a helpful basis for scaling up and scaling out good practices;

(c) The co-production of knowledge (i.e. scientific, local and traditional knowledge) is effective only when supplemented with effective training, ongoing learning and communication of results and outcomes of adaptation projects and practices to the knowledge holders;

(d) Adaptation planning and actions that are flexible and reflect capacity and institutional structure at all levels have led to increased acceptance and increased ability of people to respond to changing needs. The flexibility and responsiveness can be best ascertained when adaptation plans and priorities use the evidence base of knowledge for current variability and future impacts, institutional arrangements, the sociopolitical context and capacity at different levels, and when there are mechanisms in place for regular review in the light of new knowledge, unexpected events and changes in capacity. For example, explaining the links between ecosystem and adaptation projects and national priorities, plans, programmes, strategies and policies, including the process to formulate and implement NAPs, is useful;

(e) The process to formulate and implement NAPs under the Cancun Adaptation Framework offers an important opportunity for countries to link national planning processes to local knowledge and experiences. However, specific guidance, measures and mechanisms are needed to link local experiences and national priority-setting processes;

(f) Clear measures of effectiveness disaggregated to demonstrate the impact on reducing the vulnerability of different groups, sectors and locations are essential. These measures are often hindered by a lack of clarity on how project goals and activities are linked to addressing vulnerability to specific climate hazards, trends and variability by managing ecosystems;

(g) There is a need to build understanding of the time required to obtain positive results in relation to adaptation goals of different adaptation approaches;

(h) Information used in assessing the replicability of adaptation approaches, such as the resources required, and more detailed information on the scale of the intervention and how this relates to the scale of the impacts is critical for effective adaptation planning and practices.

192. In addition to gaps with regards to the provision and dissemination of information and knowledge on good practices and lessons learned, the following actions are recommended in the light of gaps and challenges to scale up adaptation actions addressing these issues:

(a) Capacity-building activities and adequate national level coordination structures or mechanisms are essential factors for effectively linking national and local adaptation planning. The process to formulate and implement NAPs could provide a useful entry point through which to strengthen the capacity of public institutions and to facilitate coordination for adaptation planning and practices at different levels;

(b) Enhancing the technical capacity to analyse risks and planning for effective adaptation are critically important and effective technological solutions;

(c) In addition to adequate financial resources and financial instruments, a flexible and decentralized funding structure is also critical. Such a structure will provide local and vulnerable communities with the ability to determine how best to use the financial resources made available to them from higher level authorities for scaling up adaptation planning and practices;

(d) Political will, local institutional set-up (or local ownership) and financial commitment among countries sharing the transboundary water resources can be crucial to ensure successful coordinated action to reduce vulnerability of such transboundary water resources. Time investment, which is often crucial in building collaborative partnerships to manage water resources, will be also crucial in this regard.

193. An effective M&E mechanism is also an integral part of the adaptation planning processes. The creation of this mechanism could include developing, among others, a phased approach to risk assessment; and an understanding of how to measure, attribute, put a time frame on (where impacts may take a long time to detect), cost, identify the impacts of, and build an evidence base. Ensuring adequate resources are dedicated to M&E; as well as developing indicators that cover context, impact and generate information that will address gaps in the evidence base; and including M&E from the start will help in this process.

Annex I

List of case studies by thematic area

[English only]

Table 1
Case studies addressing ecosystems

Case study code	*Organization or Party*	*Case study title*	*Further information*
UNDPE01	United Nations Development Programme (UNDP)	*Adaptation Planning in the Strengthening Ecosystem-based Adaptation (EbA) in Mountain Ecosystems*	<http://www.undp-alm.org/projects/mountain-eba> <http://www.ebaflagship.org/component/content/article/201-about/474-mountain-eba-programme> <http://www.ebaflagship.org/peru> (in Spanish)
EcuadorE02	Ecuador	*Adaptation to the Impact of Rapid Glacier Retreat in the Tropical Andes Project (PRAA)*	Ministerio del Ambiente Ecuador: <www.ambiente.gob.ec> (in Spanish)
CanadaE03	Canada	*Agriculture Adaptation to Climate Change with No-till Diffusion*	
CanadaE04	Canada	*Assessing Climate Change Impacts, Vulnerability, and Adaptation: Case Study of the Pineland Forest Section in Southeastern Manitoba*	<http://www.gov.mb.ca/conservation/forestry>
IUCNE05	International Union for Conservation of Nature (IUCN); Sustainable Development Foundation	*Building Resilience to Climate Change Impacts in Coastal Southeast Asia (BCR), Chantaburi and Trat province, Thailand*	IUCN: <www.iucn.org/building-coastal-resilience> Sustainable Development Foundation: <www.sdfthai.org> (in Thai)
ILOE06	International Labour Organization (ILO)	*Climate Change Adaptation Project (CCAP) – Building Climate Resilient Communities through Innovative and Integrated Financial and Risk Transfer*	<http://apgreenjobs.ilo.org/project/adaptation-to-climate-change-for-vulnerable-farming-populations-ccap> <http://www.ilo.org/global/topics/green-

Case study code	*Organization or Party*	*Case study title*	*Further information*
		Mechanisms	jobs/projects/asia/WCMS_218885/lang--en/index.htm>
BrazilE07	Brazil	*Centro de Formação Mandacaru de Pedro II*	
WWFE08	World Wide Fund for Nature (WWF)	*Climate Change Vulnerability Assessment and Adaptation Plan for Vaigach Island (Russia)*	Brief in English: <http://www.wwf.mg/?213511/WWF-maps-past-and-future-climate-threats-in-Russian-Arctic> Full assessment report in Russian: <http://wwf.ru/resources/publ/book/964>
CATIEE09	Tropical Agricultural Research and Higher Education Center	*Climate Coffee Tool for Adaptation Decisions*	<http://catie.ac.cr/en>
BirdLifeE10	BirdLife International secretariat	*Climate Resilient Altitudinal Gradient: Testing the Concept in the Lake Kivu/Rusizi River Catchments*	Project proposal details and fact sheets: <http://www.birdlife.org/africa/projects/enhancing-climate-change-resilience-great-lakes-region-watersheds-lake-kivu>
UNEPE11	United Nations Environment Programme (UNEP)	*Coastal Ecosystem-based Adaptation in Small Island Developing States (SIDS)*	<http://www.ebaflagship.org/ecosystems/coastal>
NestléE12	Nestlé	*Coffee Smallholders Adaptation to Climate Change via Agro-forestry and Reforestation Approach*	<http://www.nestle-nespresso.com/asset-libraries/Related%20documents%20not%20indexed/Nespresso%20Project%20Background%20-%20Agro-forestry%20Program.pdf>
CanadaE13	Canada	*Collaborative Planning and Management to Reduce Wildfire Risk (case study done as part of the project Economic Instruments to Support Adaptation to Climate Change in Forestry Project)*	<http://hnelson.forestry.ubc.ca/projects>
IUCNE14	IUCN	*Community Environment Conservation Funds (CECF) as a Tool to Catalyze Water Resources Management in Upper Aswa Sub Catchment, Uganda*	<http://www.uwasnet.org/Elgg/best_practice/view/6128/community-environment-conservation-fund-cecf-as-a-tool-to-catalyze-water-resources-management>
IUCNE15	IUCN	*Community-based Ecological Mangrove Restoration in Thailand*	Ecosystems Protecting Infrastructure and Communities (EPIC) project: <www.iucn.org/epic> Mangrove Action project:

Case study code	*Organization or Party*	*Case study title*	*Further information*
			<http://mangroveactionproject.org>
SEIE16	Agricultural Research for Development; Tropical Agricultural Research and Higher Education Center; Stockholm Environment Institute (SEI)	*EcoAdapt: Ecosystem-based Strategies and Innovations in Water Governance Networks for Adaptation to Climate Change in Latin American Landscapes*	<www.ecoadapt.eu> (in Spanish)
UNDPE17	UNDP	*Eco-system Based Adaptation (EbA) Through Water-conscious and Climate Resilient Agro-ecological Production in Critical Watersheds in Eritrea, Mongolia and Nicaragua*	Eritrea: <http://www.undp-alm.org/projects/af-eritrea> Mongolia: <http://www.undp-alm.org/projects/af-mongolia> Nicaragua: <http://www.undp-alm.org/projects/af-nicaragua>
BirdLifeE18	BirdLife International secretariat	*Ecosystem Conservation for Climate Change Adaptation in East Africa*	<http://www.birdlife.org/africa/projects/ecosystem-conservation-climate-change-adaptation-east-africa>
IUCNE19	IUCN	*Ecosystem Restoration through Promotion of Green Infrastructure: an Ecosystem based Adaptation Approach to Climate Change, a Case from Nepal*	<https://cmsdata.iucn.org/downloads/long_20draft.pdf>
CIE20	Conservation International	*Ecosystem-based Adaptation in the Namakwa District South Africa*	<http://www.conservation.org/projects/Pages/adapting-to-climate-change-ecosystem-based-adaptation.aspx>
SEIE21	SEI	*Ecosystems, Development, and Climate Adaptation Improving the Knowledge Base for Planning, Policy and Management*	<http://www.sei-international.org/publications?pid=2173>
CIE22	Conservation International	*Fisheries Management in the Verde Island Passage: the Case of the Seasonal Closure of the Balayan Bay, Batangas Province, Philippines*	<http://ian.umces.edu/pdfs/ian_report_315.pdf>
IUCNE23	IUCN	*Forest Restoration Applied to the Regional Context of Mesoamerica and the Caribbean: Functional Restoration of the Countryside*	Forest Restoration Manual database and preliminary draft of the Digital Restoration Herbarium: <http://especiesrestauracion-

Case study code	*Organization or Party*	*Case study title*	*Further information*
			uicn.org/esp/index.php> (in Spanish)
USAE24	United States of America	*Greater Farallones National Marine Sanctuary Climate-smart Conservation*	<http://farallones.noaa.gov/manage/climate/climatesmart.html> <http://sanctuaries.noaa.gov/management/climate/welcome.html>
ILOE25	ILO	*Green Livelihoods Access for Central Kalimantan's Inclusive Environmental Response to Climate Change (GLACIER)*	<http://www.ilo.org/jakarta/whatwedo/projects/WCMS_202802/lang--en/index.htm>
CAREE26	CARE International	*Hariyo-ban Program: Integrated Approach for Vulnerability Assessment and Adaptation Planning*	<http://www.wwfnepal.org/hariyobanprogram>
EthiopiaE27	Ethiopia	*Humbo Community Managed Natural Regeneration Forest Project*	<http://www.wvi.org/ethiopia>
EthiopiaE28	Ethiopia	*Indigenous Agro forestry Practices in Gedeo Zone Wonago Woreda*	PHE Ethiopia Consortium: <www.phe-ethiopia.org>
UNDPE29	UNDP	*Integrated Climate Change Adaptation in Communal Reserves in the Amazon Rainforest (EbA Amazon project)*	<http://www.pe.undp.org/content/peru/es/home/operations/projects/environment_and_energy/gestion-integrada-del-cambio-climatico-en-las-reservas-comunales.html> (in Spanish)
WMOE30	World Meteorological Organization; Global Water Partnership	*Integrated Drought Management Programme (IDMP)*	<www.droughtmanagement.info>
PracticalActionE31	Practical Action	*Integrating Livelihood-centered Disaster Risk Reduction into Local, Regional and National Adaptation Planning Processes*	<http://practicalaction.org/livelihood-centred-approaches-to-disaster-management>
UNHabitatE32	United Nations Human Settlements Programme	*Lami Town, Fiji: Ecosystem-based Adaptation Study*	<http://www.fukuoka.unhabitat.org/programmes/ccci/index_en.html>
IUCNE33	IUCN	*Linking Science with Local Knowledge: Local Adaptation Planning for Ecosystem- and Community-based Adaptation in Northern and North-eastern Thailand*	<http://iucn.org/about/union/secretariat/offices/asia/asia_where_work/thailand/our_projects/usaid_mekong_arcc_thailand>
FS-UNEPE34	Frankfurt School – UNEP Collaborating Centre for Climate and Sustainable Energy	*Microfinance for Ecosystem-based Adaptation (MEbA)*	<http://fs-unep-centre.org/projects/microfinance-

Case study code	*Organization or Party*	*Case study title*	*Further information*
	Finance		ecosystem-based-adaptation-climate-change> <http://www.pnuma.org/meba> (in Spanish)
IUCNE35	IUCN	*Modelo de planificación y gestión comunitaria del agua y sus recursos asociados con enfoque de microcuencas*	
CIE36	Conservation International	*Municipal Plan of Conservation and Restoration of the Atlantic Forest in Porto Seguro*	<http://www.conservation.org/global/brasil/publicacoes/Documents/PMMA-PORTO-SEGURO-TELA.pdf> (in Portuguese)
UgandaE37	Uganda	*Nakasongola NAPA Pilot project: Represents the Semi-Arid Dry Land Ecosystem The Project is located in the two communities of o Ndaiga (Kansiira Parish-Lwabiyata Sub-county) and o Kyangogolo (Kyangogolo Parish-Nabiswera Sub-county)*	<www.ccu.go.ug>
IUCNE38	IUCN	*Participatory EbA Measures in Peruvian Mountain Ecosystems*	<https://portals.iucn.org/library/sites/library/files/documents/2014-038.pdf#page=108>
ICIMODE39	International Centre for Integrated Mountain Development	*Participatory Perspective Land Use Planning for Managing and Conserving Ecosystem Services in Shifting Cultivation Landscapes*	
KenyaE40	Kenya	*Payment for Environmental Services (PES) Pilot Project in Lake Naivasha Basin, Kenya*	<http://wwf.panda.org/who_we_are/wwf_offices/kenya/solutions/index.cfm?uProjectID=KE0852>
PyreneesE41	Pyrenees Climate Change Observatory; Pyrenees Working Community	*Pyrenean Biodiversity: Development of Indicators to Follow-up Climate Change Impacts*	<http://www.atlasflorapyrenaea.org/florapyrenaea/homepage.jsp> (in Spanish) <www.opcc-ctp.org> (in French)
BlueVenturesE42	Blue Ventures	*Rebuilding Tropical Fisheries Fostering Locally Led Marine Conservation*	<http://blueventures.org>
NorwayE43	Norway	*Regional Water Management Plans*	<http://www.vannportalen.no> (in Norwegian) <https://circabc.europa.eu>
CFIE44	Community Forests International	*Scaling Resilience: Adaptation Planning*	<www.forestsinternational.org>

Case study code	*Organization or Party*	*Case study title*	*Further information*
		on Pemba Island	
ILOE45	ILO	*Sloping Agricultural Land Technology for Employment Creation*	<http://www.ilo.org/manila/whatwedo/publications/WCMS_324747/lang--en/index.htm>
AERIE46	Amazon Environmental Research Institute	*SOMAI – System of Observation and Monitoring of Indigenous Amazon*	<https://www.youtube.com/watch?v=vy03Dc6696U> <http://www.ipam.org.br/#>
IUCNE47	IUCN	*Strengthening Local Climate Change Adaptation Strategies in West Africa (Burkina Faso and Senegal)*	EPIC project: <https://www.iucn.org/epic>
BrazilE48	Brazil	*The Satoyama Initiative in Brazil*	<www.ispn.org.br/english>
RareE49	Rare	*TURF-Reserve Networks as a Platform for Building Resilience among Coastal Municipalities in the Philippines*	<http://www.fishforever.org/wp-content/uploads/2014/02/FishForeverPhilippines.pdf>
USAE50	United States of America	*Understanding Sea Level Rise to Inform Long-term Planning and Rebuilding After Hurricane Sandy*	Sea Level Rise Tool for Sandy Recovery: <http://www.globalchange.gov/browse/sea-level-rise-tool-sandy-recovery> <http://www.nyc.gov/html/planyc/html/home/home.shtml> <http://www.nyc.gov/html/planyc/html/home/home.shtml>
WWFE51	WWF	*Water and Climate Change Adaptation in the Sao Joao River Basin, Brazil*	Consórcio Intermunicipal Lagos São João: <http://www.lagossaojoao.org.br> (in Portuguese) WWF Brazil: <http://www.wwf.org.br/natureza_brasileira/areas_prioritarias/mata_atlantica/mata_atlantica_acoes_resultados/restauracao/bacia_do_rio_sao_joao> (in Portuguese) WWF: <http://wwf.panda.org/about_our_earth/about_freshwater/rivers/irbm/cases/sao_joao_river_case_study_cfm>
SEIE52	SEI	*Whole Decision-Network Analysis of Coastal Ecosystems (WD-NACE)*	<http://www.espa.ac.uk/projects/ne-i002448-1>

Case study code	*Organization or Party*	*Case study title*	*Further information*
SEIE53	SEI	*Vulnerability Assessment and Map of Rice Paddy Production in Bali/Indonesia*	

Table 2
Case studies addressing human settlements

Case study code	*Organization or Party*	*Case study title*	*Further information*
ILOHS01	International Labour Organization	*Green Works and Green Jobs in the Context of Disaster Preparedness, Response and Recovery*	<www.ilo.org>
NorwayHS02	Norway		<http://www.miljodirektoratet.no/no/Klimatilpasning_Norge/Om-klimatilpasningno/English/>
IUCNHS03	International Union for Conservation of Nature (IUCN)	*Accompanying Bonaventure Community to Construct their Community Resilient Plan Face in Climate Changes*	The Community-University Research Alliance (CURA) program: <http://www.coastalcommunitieschallenges.org/en/organisation/definition> <http://www.defisdescommunautescotieres.org> (in French)
IUCNHS04	IUCN	*Accompanying Maria Community to Construct their Community Resilient Plan Face in Climate Changes*	The CURA program: <http://www.coastalcommunitieschallenges.org/en/organisation/definition > <http://www.defisdescommunautescotieres.org> (in French)
IUCNHS05	IUCN	*Action Plan for Adaptation in the Municipality of Rivière-au-Tonnerre, Province of Québec (CA)*	The CURA program: <http://www.coastalcommunitieschallenges.org/en/organisation/definition> <http://www.defisdescommunautescotieres.org> (in French) <http://www.defisdescommunautescotieres.org/public/documents/rapports/index/plan_adaptation_rat_v2__21_nov_2014.pdf> (in French)
NetherlandsHS06	Netherlands	*Amsterdam Rainproof*	<https://www.rainproof.nl> (in Dutch)
KoreaHS07	Republic of Korea	*Building Climate Change Vulnerability (CCV) Assessment Platform: a Case Study*	

Case study code	*Organization or Party*	*Case study title*	*Further information*
		in South Korea	
EEAHS08	European Environment Agency	*Combating the Heat Island Effect and Poor Air Quality with Green Ventilation Corridors in Stuttgart (Germany)*	<http://climate-adapt.eea.europa.eu/viewmeasure?ace_measure_id=3403>
KoreaHS09	Republic of Korea	*Development of Climate Change Risk Assessment Tool (CCRAT) for Business Sector*	
EEAHS10	European Environment Agency	*Implementation of the Integrated Master Plan for Coastal Safety in Flanders (Belgium)*	<http://climate-adapt.eea.europa.eu/viewmeasure?ace_measure_id=3327>
UCCRNHS11	Urban Climate Change Research Network (UCCRN)	*Individual, Communal, and Institutional Responses to Climate Change by Low-income Households in Khulna, Bangladesh*	Action Research for Community Adaptation in Bangladesh: <www.arcab.org> UCCRN: <http://uccrn.org> <http://youtu.be/XbxfY2U0eOo>
UNHabitatHS12	United Nations Human Settlements Programme (UN-Habitat)	*Innovative Sanitation Design in Manako Gama (Sri Lanka)*	
UNHabitatHS13	UN-Habitat	*Innovative School Designs Increase Climate Resilience in Mozambique*	
KenyaHS14	Kenya	*Kenya Slum Upgrading and Prevention Programme*	
UNHabitatHS15	UN-Habitat	*Mainstreaming Gender into City-Level Climate Change Plans and Strategies in Kampala (Uganda)*	<http://mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3356> (see chapter 3)
UNHabitatHS16	UN-Habitat	*Mitigation of Sea Water Intrusion in Pallimunai East, Mannar (Sri Lanka)*	<http://unhabitat.lk/news/government-of-australia-supports-mannar-urban-council-to-mitigate-the-risk-of-sea-water-intrusion-in-a-vulnerable-coastal-village>
IUCNHS17	IUCN	*Mobilization of Local and Scientific Knowledge to Support the Process of Adaptation to the Impacts of Climate Change in Two Small Coastal Communities of New Brunswick (Canada)*	The CURA program <http://www.coastalcommunitieschallenges.org/en/organisation/definition> <http://www.defisdescommunautescotieres.org> (in French)
IUCNHS18	IUCN	*Participatory Action Research to Support*	The CURA program

Case study code	*Organization or Party*	*Case study title*	*Further information*
		the Process of Adaptation to the Impacts of Climate Change in the Territories of Cocagne, Grande-Digue and Dundas in South-west of New-Brunswick	<http://www.coastalcommunitieschallenges.org/en/organisation/definition> <http://www.defisdescommunautescotieres.org> (in French)
SEIHS19	Stockholm Environment Institute	*Participatory Urban Planning in Mozambique - Public Private People Partnerships for Climate Compatible Development (4PCCD)*	<http://cdkn.org/resource/urban-planning-mozambique>
UCCRNHS20	UCCRN	*Preparing New York City for Sea Level Rise and Coastal Storms*	New York City Panel on Climate Change 2015 report: <http://onlinelibrary.wiley.com/doi/10.1111/nyas.2015.1336.issue-1/issuetoc> <http://www1.nyc.gov/office-of-the-mayor/news/122-15/mayor-de-blasio-releases-npcc-2015-report-providing-climate-projections-2100-the-first> New York City Special Initiative for Rebuilding and Resiliency 2013: <http://www.nyc.gov/html/sirr> New York City Panel on Climate Change 2013 report: <http://www.nyc.gov/html/planyc2030/downloads/pdf/npcc_climate_risk_information_2013_report.pdf> New York City Panel on Climate Change 2010 report: <http://www.nyas.org/Publications/Annals/Detail.aspx?cid=ab9d0f9f-1cb1-4f21-b0c8-7607daa5dfcc> UCCRN: <http://uccrn.org> <http://youtu.be/XbxfY2U0eOo>
StudioHS21	StudioNavarra; GEOHAUS	*Real Estate Evaluation in Germany*	
StudioHS22	StudioNavarra; Hansa Luftbild Gruppe	*Real Property Registration and Land Information (Cadastre) System Development Project*	
EEAHS23	European Environment Agency	*Room for the River Waal – protecting*	<http://climate-adapt.eea.europa.eu/viewmeasure?ace_mea

Case study code	*Organization or Party*	*Case study title*	*Further information*
		the City of Nijmegen	sure_id=4401>
UNHabitatHS24	UN-Habitat	*Rooting Sustainable Development and Desert Prevention in Urban Local Communities in Bobo Dioulasso (Burkina Faso) through Participatory Sanitation Improvement and Afforestation*	<http://mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3356>
EIHS25	Ecologic Institute	*Socio-economic and Cultural Issues in the Planning and Implementation of Adaptation Measures: the Case of Timmendorfer Strand, Germany*	<http://www.coastalwiki.org/wiki/ICZM-Best_practice_case_study_in_the_Bay_of_L%C3%BCbeck>
IUCNHS26	IUCN	*Strategic Planning for Sainte-Flavie Municipality (Québec, CA), in the Context of Climate Change Adaptation*	The CURA program <http://www.coastalcommunitieschallenges.org/en/organisation/definition> <http://www.coastalcommunitieschallenges.org> (in French) <http://www.sainte-flavie.net/images/planification_stratégique_document_intégral.pdf> (in French)
UNHabitatHS27	UN-Habitat	*Sustainable Resettlement and Reconstruction in Flood-prone Peri-urban Areas in Saint Louis (Senegal)*	<http://www.fukuoka.unhabitat.org/programmes/ccci/pdf/10_Cities_and_Climate_Change_Initiative_Newsletter.pdf>
NetherlandsHS28	Netherlands	*The National Delta Programme of the Netherlands*	<https://www.government.nl/latest/news/2014/09/16/delta-programme-2015-a-safe-and-liveable-country-in-the-21st-century>
EEAHS29	European Environment Agency	*Urban River Restoration: a Sustainable Strategy for Storm-water Management in Lodz, Poland*	<http://climate-adapt.eea.europa.eu/viewmeasure?ace_measure_id=4102>
WFEOHS30	World Federation of Engineering Organizations (WFEO)	*WFEO Knowledge Development and Capacity Building Program – Phase I: Engineering Vulnerability Assessment of Infrastructure to Climate Change – Sewage Collection and Treatment System in Limon, Costa Rica*	
WFEOHS31	WFEO	*WFEO Knowledge Development and Capacity Building Program – Phase II: Assessment of Climate Risk and Construction Practices for Highway Bridge*	

Case study code	*Organization or Party*	*Case study title*	*Further information*
		Infrastructure in Honduras	
UNHabitatHS32	UN-Habitat	*Youth Initiative to Sustain Mangroves and Livelihoods in Mombasa (Kenya)*	<http://unhabitat.org/urban-initiatives/cities-and-climate-change-initiative>
StudioHS33	StudioNavarra	*CLIMATEXCHANGE: OnLine Collaboration Hub on Sustainable Urban Development and Climate Change Adaptation and Mitigation*	<www.climatexchange.eu>

Table 3
Case studies addressing health

Case study code	*Organization or Party*	*Case study title*	*Further information*
WHOH01	World Health Organization (WHO)	*Building Adaptation to Climate Change in Health in Least Developed Countries through Resilient Water, Sanitation and Hygiene (WASH)*	<http://www.who.int/globalchange/projects/wash/en>
USAH02	United States of America	*Building Resilience against Climate Effects*	<http://www.cdc.gov/climateandhealth/brace.htm>
WHOH03	WHO	*Health Component of National Adaptation Plans*	
EEAH04	European Environment Agency	*Implementation of the Heat-Health Action Plan of the former Yugoslav Republic of Macedonia*	<http://climate-adapt.eea.europa.eu/viewmeasure?ace_measure_id=3801>
WHO/UNDPH05	WHO	*Piloting Climate Change Adaptation to Protect Human Health in Barbados*	<http://www.who.int/globalchange/projects/adaptation/en>
WHO/UNDPH06	WHO	*Piloting Climate Change Adaptation to Protect Human Health in China*	<http://www.who.int/globalchange/projects/adaptation/en> <http://www.adaptationlearning.net/project/piloting-climate-change-adaptation-protect-human-health>
WHO/UNDPH07	WHO; United Nations Development Programme (UNDP)	*Piloting Climate Change Adaptation to Protect Human Health in Fiji*	<http://www.undp-alm.org/projects/sccf-piloting-climate-change-adaptation-protect-human-health-fiji> <http://www.adaptationlearning.net/project/piloting-climate-change-adaptation-

Case study code	*Organization or Party*	*Case study title*	*Further information*
			protect-human-health> <http://www.adaptationlearning.net/node/45>
WHO/UNDPH08	WHO; UNDP	*Piloting Climate Change Adaptation to Protect Human Health in Jordan*	<http://www.undp-alm.org/projects/sccf-piloting-climate-change-adaptation-protect-human-health-jordan> <http://www.adaptationlearning.net/project/piloting-climate-change-adaptation-protect-human-health>
WHO/UNDPH09	WHO; UNDP	*Piloting Climate Change Adaptation to Protect Human Health in Uzbekistan*	<http://www.undp-alm.org/projects/sccf-piloting-climate-change-adaptation-protect-human-health-uzbekistan> <http://www.adaptationlearning.net/project/piloting-climate-change-adaptation-protect-human-health>
WHO/UNDPH10	WHO	*Protecting Health from Climate Change: Vulnerability and Adaptation Assessment*	<http://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/country-work/protecting-health-from-climate-change-a-seven-country-initiative-in-the-eastern-part-of-the-who-european-region>
UNITARH11	United Nations Institute for Training and Research	*Resource Guide for Advanced Learning on Understanding the Climate Change and Health Interface*	<http://uncclearn.org/advanced-learning/climate_change_and_health_interactive> (interactive)
WHO/UNDPH12	WHO; UNDP	*Strengthening Health Systems, Institutions and Decision-making Processes to be Resilient to Climate-related Health Risks*	
CanadaH13	Canada	*The Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities*	<http://eloka-arctic.org/sites/eloka-arctic.org/files/documents/myers.pdf>
WHO/KenyaH14	Kenya; WHO	*Kenya Malaria Early Warning System Strengthening (KMEWS)*	
WHO/UNDPH15	WHO; UNDP	*Piloting Climate Change Adaptation to Protect Human Health in Bhutan*	<http://www.who.int/globalchange/projects/adaptation/en/index2.html>

Table 4
Case studies addressing water resources

Case study code	*Organization or Party*	*Case study title*	*Further information*
CostaRicaW01	Costa Rica (Ministry of Environment and Energy and National Meteorological Institute)	*Early warning system (EWS) for Hydrometeorological Hazards (Case Study ,Sarapiquí River Basin)*	<http://www.youtube.com/watch?feature=player_embedded&v=-WVu6PqZiOw> (in Spanish)
IGESW02	Institute for Global Environmental Strategies	*Adaptation Effectiveness Indicators: a Gangetic Basin Case Study*	<http://www.iges.or.jp/en/natural-resource/index.html>
UNECEW03	United Nations Economic Commission for Europe (UNECE) (Convention on the Protection and Use of Transboundary Watercourses and International Lakes); Organization for Security and Co-operation in Europe (OSCE)	*Adaptation Process in the Dniester Basin*	<http://www1.unece.org/ehlm/platform/display/ClimateChange/Dniester>
UNESCO-IHEW04	UNESCO-IHE Institute for Water Education; Deltares	*Adaptation to Climate Change in Colombia: a Tipping Point Analysis*	<http://www.climacol.nl> (in Spanish)
AGWAW05	Alliance for Global Water Adaptation (AGWA)	*AGWA Decision Support System*	<http://alliance4water.org/About/DSS/index.html>
MonsantoW06	Monsanto	*AquaTEK™, Irrigation Water Management System for Corn Growers*	<www.aqua-blog.com> (in Italian) <http://www.monsanto.com/improvingagriculture/pages/aquatek.aspx> <http://aqua-blog.com/category/aquatek> (in Italian) <http://monsantoblog.com/2014/03/06/italian-farmer-praises-aquatek-project>
SpainW07	Spain	*Assessment of Climate Change Impact in Spanish Water Resources*	<http://www.magrama.gob.es/es/agua/temas/planificacion-hidrologica/planificacion-hidrologica/egest_cc_rh.aspx> (in Spanish)
WMO/GWPW08	World Meteorological Organization; Global Water Partnership (GWP)	*Associated Programme on Flood Management (APFM) and HelpDesk on Integrated Flood Management (IFM)*	<www.floodmanagement.info>
StudioW09	StudioNavarra; Anbessa Environmental Consulting	*BeWater Project*	<www.bewaterproject.eu>
METOFFICEW10	Met Office Hadley Centre for Climate Change	*Building Climate Resilience in the Pyanj River Basin*	<www.ppcr.tj>
ICPDRW11	International Commission for the	*Climate Change Adaptation Strategy*	<http://www.icpdr.org/main/sites/default/fi

Case study code	*Organization or Party*	*Case study title*	*Further information*
	Protection of the Danube River	*for the Danube River Basin*	les/nodes/documents/icpdr_climate-adaptation-strategy.pdf> <http://www.icpdr.org/main/sites/default/files/Danube%20Climate%20Adaptation%20Study_final.pdf> <http://www.icpdr.org/main/activities-projects/climate-change-adaptation>
ICPDRW12	International Commission for the Protection of the Rhine	*Climate Change Adaptation Strategy for the International Rhine River Basin*	<www.iksr.org/en> <www.iksr.org/index.php?id=342&L=3>
UNECEW13	UNECE (Convention on the Protection and Use of Transboundary Watercourses and International Lakes); OSCE; United States Army Corps of Engineers; United States Army Engineer Institute for Water Resources; Alliance for Global Water Adaptation	*Climate Change and Water Security in the Dniester River Basin*	UNECE project information: <https://www2.unece.org/ehlm/platform/display/ClimateChange/Dniester> Workshop information Moldova: <https://www2.unece.org/ehlm/platform/pages/viewpage.action?pageId=31522907> Workshop information Ukraine: < https://www2.unece.org/ehlm/platform/pages/viewpage.action?pageId=31522905>
NetherlandsW14	Netherlands	*Climate Proof Freshwater Supply at Farm Level: Lessons Learnt from Pilots in the Southwestern Part of The Netherlands*	Project website: <www.go-fresh.info> (in Dutch) Stichting Waterbuffer: <http://www.waterbuffer.net/english> (in English) Knowledge for Climate: <http://www.knowledgeforclimate.nl/freshwater> (in English) Project Spaarwater: <www.spaarwater.com> (in Dutch) Delta Programme – Freshwater: <https://www.deltares.nl/en/projects/freshwater-availability-delta-programme>
USAW15	United States of America	*Climate Ready Estuaries*	<http://www2.epa.gov/cre>
ICIMODW16	International Centre for Integrated Mountain Development	*Community Involvement in Reviving Drying Springs as an Adaptation Tool in Mid Hills of the Hind Kush Himalayas*	
VeoliaW17	Veolia	*Copenhagen, a City Resilient to Flooding*	<http://www.climatesolutionsplatform.org>

Case study code	*Organization or Party*	*Case study title*	*Further information*
NetherlandsW18	Netherlands	*Drylands Development Programme (DryDev), a Farmer Led Programme to Enhance Water Management, Food Security and Rural Economic Development in the Drylands of Burkina Faso, Mali, Niger, Ethiopia, and Kenya*	<http://www.worldagroforestry.org>
GWPW19	GWP	*Domestic Wastewater Treatment in Armenia*	<http://www.cwp.am/images/stories/Parakar_Article_for_Web-eng.pdf>
USAW20	United States of America	*Early Warning and Water Resources*	<www.drought.gov>
UNEPW21	United Nations Environment Programme	*Ecosystem Based Adaptation in Mountain Countries – Peru, Nepal and Uganda*	<http://ebaflagship.org>
RareW22	Rare	*Enhancing Climate Compatible Development through Sustainable Watersheds and Forest Management in Colombia*	More information on Rare's watershed work: <http://www.rare.org/watersheds#.VOc7ZvnF-So>
GWPW23	GWP	*Enhancing Climate Resilience of Communities and Ecosystems in Lake Cyohoha Catchment (Burundi/Rwanda)*	<http://www.gwp.org/en/gwp-in-action/Impact-Stories/Enhancing-Climate-Resilience-in-Burundi-Rwanda-Transboundary-Catchment/>
GWPW24	GWP	*Enhancing Water Security and Climate Resilience in Ghana's National Development Planning Process*	Reports: <www.gwpghana.org>
GWPW25	GWP	*Enhancing Water Security in the Zimbabwe National Climate Change Response Strategy*	<http://www.gwp.org/en/GWP-SouthernAfrica/GWP-SA-IN-ACTION/News/Zimbabwes-Climate-Change-Response-Strategy-Adopted-at-final-consultation-meeting> <http://www.gwp.org/WACDEP/NEWS-AND-EVENTS/News-Archive/WACDEP-Zimbabwe-Empowers-Water-Resources-Management-Grassroots-Stakeholders-to-contribute-into-the-NCCRS-review-process>
NSESCW26	National Socio-Environmental Synthesis Center	*Flood Management Decision-making in the Iowa River Basin under Climate Uncertainty*	<http://www.climacol.nl> (in Spanish)

Case study code	*Organization or Party*	*Case study title*	*Further information*
UNECEW27	UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes; OSCE	*Flood Mitigation through Ecosystem Restoration in the Dniester Basin*	
TNCW28	The Nature Conservancy; Kako`o `Oiwi, Papahana Kuaola; Paepae o He`eia	*Hanohano He`eia – a Biocultural Approach to Climate Change Adaptation and Anti-fragility*	<www.kakoooiwi.org> <www.paepaeoheeia.org> <http://papahanakuaola.com> <http://www.doi.gov//csc/pacific/index.cfm>
MexicoW29	Mexico	*Implementation of Adaptation Measures in a Coastal Wetland in Tabasco, Mexico*	
UNECEW30	UNECE (Convention on the Protection and Use of Transboundary Watercourses and International Lakes); OSCE	*Improving Flood Communication in the Dniester Basin*	<http://www1.unece.org/ehlm/platform/display/ClimateChange/Dniester>
NetherlandsW31	Netherlands	*Mainstreaming Climate Adaptation in Water Management and Nature Policies: Case Study in the Dutch Fen Meadow Area*	Climate adaptation policies of the Province of South Holland: <http://www.ruimtevoorklimaat.nl/cases/02-Structuurvisie-Zuid-Holland> (in Dutch) Research project Waarheen met het Veen: <http://www.levenmetwater.nl/projecten/waarheen-met-het-veen> (in Dutch) (including movie) Options for regional adaptation strategies for peatlands in the Netherlands: <http://www.veenweidegebieden-oras.nl> (in Dutch) Veenweide Innovatie Centrum: <http://www.veenweiden.nl> (in Dutch)
NetherlandsW32	Netherlands	*Mekong Delta Plan*	<https://www.wageningenur.nl/upload_mm/2/c/3/b5f2e669-cb48-4ed7-afb6-682f5216fe7d_mekong.pdf> <http://www.mekongdeltaplan.com>
UCCRNW33	Urban Climate Change Research Network	*Operationalizing Urban Climate Resilience in Water and Sanitation Systems in Metro Manila, Philippines*	<http://uccrn.org> <http://youtu.be/XbxfY2U0eOo>
OCW34	Ouranos Consortium	*Ouranos' Maritime Environment Program*	Ouranos' Maritime Environment Program: <http://www.ouranos.ca/en/scientific-program/impacts-adaptation/maritime-

Case study code	*Organization or Party*	*Case study title*	*Further information*
			environment.php>
OCW35	Ouranos Consortium	*Ouranos' Water Management Program*	Ouranos' Water Management Program: <http://www.ouranos.ca/en/scientific-program/impacts-adaptation/water-resources.php> Freedom space project: Report: <http://www.ouranos.ca/media/publication/299_RapportBironetal2013.pdf> (in French) Fact sheet: <http://www.ouranos.ca/media/publication/319_FicheBiron2013_WebEn.pdf> Watershed adaptation planning project: Report: <http://www.ouranos.ca/media/publication/308_RapportLepageMilot2013.pdf> (in French) Fact sheet: <http://www.ouranos.ca/media/publication/308_FicheLepage2014_WebFr.pdf> (in French)
SPREPW36	Secretariat of the Pacific Regional Environment Programme	*Pacific Adaptation to Climate Change (PACC) Project*	<https://www.sprep.org/pacc>
PracticalActionW37	Practical Action	*Participatory Monitoring and Evaluation of Climate-exacerbated Conflict Situations for Improved Community Resilience and Adaptive Capacity in North Darfur*	
GWPW38	GWP	*Preparation of a Local Adaptation Plan of Action (LAPA) in Lamatar VDC, Nepal*	<www.jvs-nwp.org.np>
CanadaW39	Canada	*Sea Level Rise in British Columbia, Canada: Mobilizing Science into Action*	2013 case study report: <http://www.retooling.ca/_Library/docs/bc_sea_level_rise_en.pdf>
AdelphiW40	Adelphi	*Solar Based Drinking Water Treatment at Desaraju Palli, Prakasam District, Andhra Pradesh, India*	<https://www.adelphi.de/en/news/prize-adaptcap-pilot-project>

Case study code	*Organization or Party*	*Case study title*	*Further information*
UNECEW41	UNECE (Convention on the Protection and Use of Transboundary Watercourses and International Lakes)	*Strategic Framework for the Neman River Basin Adaptation to Climate Change*	<https://www2.unece.org/ehlm/platform/display/ClimateChange/Neman>
UNEPW42	United Nations Environment Programme	*The Enhancement of Water Related Community Climate Change Coping Mechanisms and Restoration of Water and Ecosystem Functioning and Resilience in Chicualacuala District (Gaza Province) in Mozambique*	<http://www.unep.org/climatechange/adaptation/Portals/133/documents/Chicualacuala_Report-Climate_Change_Impacts_n_Coping_Strategies.pdf> <www.iucn.org/news_homepage/news_by_date/2011_news_gb/november_news_2011/?8594/IWRM-experiences-shared-between-Kenya-and-Mozambique> <http://wiki.mdgfund.net/Environment_Mainstreaming_and_Adaptation_to_Climate_Change>
Trinidad&Tobago W43	Trinidad and Tobago	*The Matura Watershed: a Case Study Towards Adaptive and Integrated Water Resources Management (Trinidad and Tobago)*	<http://www.gwp.org/en/ToolBox/CASE-STUDIES/Americas--Caribbean/Trinidad-and-Tobago-Towards-adaptive-IWRM-in-Matura-basin-461/>
BrazilW44	Brazil	*The Record Drought and Water Crisis of 2014–2015 in Southeastern Brazil*	<www.cemaden.gov.br> (in Portuguese)
EcuadorW45	Ecuador	*Vulnerability Analysis of Emblematic Hydroelectric Power Plants of Ecuador under the Climate Change Effects (CHECC)*	<http://www.ambiente.gob.ec/> (in Spanish)
VeoliaW46	Veolia Environmental Services	*Wastewaters, Source of Energy and Water Re-use in Urumqi, China*	<http://www.climatesolutionsplatform.org>
WWFW47	World Wide Fund for Nature (WWF)	*Water and Climate Change Adaptation in the Danube River Basin, Central and Eastern Europe*	<http://www.icpdr.org/main> WWF – Danube River: <http://wwf.panda.org/about_our_earth/about_freshwater/freshwater_problems/river_decline/10_rivers_risk/danube/> WWF – Danube River – Solutions: <http://wwf.panda.org/about_our_earth/about_freshwater/freshwater_problems/river_decline/10_rivers_risk/danube/danube_solutions/>

Case study code	*Organization or Party*	*Case study title*	*Further information*
			WWF – Danube River delta: <http://wwf.panda.org/about_our_earth/ecoregions/danube_river_delta.cfm>
WWFW48	WWF	*Water and Climate Change Adaptation in the Godavari River Basin, India*	<http://bettercotton.org> WWF India – Thirsty crops and better cotton: <http://www.wwfindia.org/about_wwf/reducing_footprint/sustainable_agriculture> Mission Kakatiya (Government of Telangana sponsored programme for tank restoration): <http://missionkakatiya.cgg.gov.in>
WWFW49	WWF	*Water and Climate Change Adaptation in the Great Ruaha River Basin, Tanzania*	<http://wwf.panda.org/who_we_are/wwf_offices/tanzania/wwf_tanzania_our_solutions/index.cfm?uProjectID=TZ0860>
WWFW50	WWF	*Water and Climate Change Adaptation in the Mid-Yangtze River Basin, China*	<http://en.wwfchina.org/en/what_we_do/living_yangtze>
WWFW51	WWF	*Water and Climate Change Adaptation in the Rio Conchos Basin, Mexico*	<http://wwf.panda.org/about_our_earth/about_freshwater/freshwater_problems/river_decline/10_rivers_risk/rio_grande_bravo>
ACCCW52	Adapting to Climate Change in China (ACCC)	*Water Resource and Grassland Management in Inner Mongolia with ACCC*	ACCC website: <http://www.ccadaptation.org.cn/>

Table 5

Case studies addressing structures and processes linking local and national adaptation planning

Case study code	*Organization or Party*	*Case study title*	*Further information*
KenyaL01	Kenya; United Kingdom of Great Britain and Northern Ireland	*Aligning Delivery of Climate Information Services for Development in Kenya*	<http://www.adaconsortium.org> <http://www.meteo.go.ke> <http://www.metoffice.gov.uk>
KenyaL02	Kenya; United Kingdom of Great Britain	*Building Resilience through Climate Mainstreaming in Kenya's Drylands or Promoting Adaptation and Climate Resilient Growth through Devolved*	<www.adaconsortium.org> <www.iied.org> <www.meteo.go.ke> <www.metoffice.gov.uk>

Case study code	*Organization or Party*	*Case study title*	*Further information*
		County Climate Finance	<www.ndma.go.ke>
IUCNL03	International Union for Conservation of Nature	*Climate Change Gender Action Plans: Integrating Gender Equality Considerations for More Effective Climate Planning and Response*	<https://portals.iucn.org/union/sites/union/files/doc/the_art_of_implementation.pdf>
LundL04	Centre for Environmental and Climate Research, Lund University	*Klimatsäkrat Skåne* (Climate-proofed Scania)	<http://www.cec.lu.se/collaboration-outreach/cec-reports-synthesis-reports> (report in Swedish)
UNDPL05	United Nations Development Programme	*Linking National and Local Planning Processes to Strengthen Comprehensive Risk Management in the Hindu Kish Himalayan Region*	
KoreaL06	Republic of Korea	*Local Adaptation Planning*	
SwedenL07	Sweden; United Nations Capital Development Fund	*Local Climate Adaptive Living Facility (LoCAL) – The Case of Cambodia*	<http://www.local-uncdf.org> <http://www.local-uncdf.org/cambodia.html>
NorwayL08	GRID-Arendal; University College London; Norway	*Many Strong Voices*	<http://www.manystrongvoices.org>
CATIEL09	Tropical Agricultural Research and Higher Education Center	*Methodology for the Design of Local Strategies for Climate Change Adaptation (ELACC in Spanish) Based on 7 Case Studies (1 in Costa Rica, 1 in Honduras, 1 in Guatemala, 1 in El Salvador and 3 in Mexico)*	<http://revistapapd.catie.ac.cr/diplomado-estrategias-locales-de-adaptacion-al-cambio-climatico-elacc-culmina-con-exito-en-chiapas-mexico> (in Spanish)
ChileL10	Chile	*National Adaptation Plan to Climate Change*	Documents linked to the public opinion survey process: <http://portal.mma.gob.cl/instrumentos-estrategicos> (in Spanish) National Adaptation Plan for Climate Change: <http://portal.mma.gob.cl/wp-content/uploads/2014/12/PAN-web2.pdf> (in Spanish)
NepalL11	Nepal	*Nepal Climate Change Support Programme*	
KoreaL12	Republic of Korea	*Production and Supply of the*	

Case study code	*Organization or Party*	*Case study title*	*Further information*
		Guidebook to Develop a Project of Supporting the Vulnerable People from Extreme Weather	
USAL13	United States of America	*Supporting Adaptation Decision Making with Co-developed Regional Science*	<https://nccwsc.usgs.gov> <http://www.doi.gov//csc>
NorwayL14	Norway	*The Cities of the Future – Norway*	<https://www.regjeringen.no/en/topics/municipalities-and-regions/by--og-stedsutvikling/framtidensbyer/cities-of-the-future/id548028>
UNESCWAL15	United Nations Economic and Social Commission for Western Asia	*The Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-economic Vulnerability in the Arab Region (RICCAR)*	<www.escwa.un.org/RICCAR>
WMOL16	World Meteorological Organization	*Working Together for Climate Services in Tanzania and Malawi*	<http://www.gfcs-climate.org/Norway_2>
RussiaL17	Russian Federation	*Climate Change and Assessment of Adaptation Measures for Rostov Region*	<http://www.donland.ru> (in Russian)

Annex II

Tools and methods referred to in the case studies

[English only]

Table 6
Tools and methods referred to in the case studies addressing ecosystems

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
BirdLifeE18	BirdLife International secretariat	Combining participatory learning and action tools with BirdLife's toolkit for assessing ecosystem services (TESSA)[1]	TESSA engages local communities in the consultation and data collection, interpretation and verification process, helping the community to understand and communicate to decision makers their dependence on ecosystems and the implications of different land-use scenarios, as it did for example when used in Burundi as part of BirdLife's ecosystem conservation initiative in East Africa by the Serukubeze community. A customized toolkit results from the process	✓	✓	
BirdLifeE10	BirdLife International secretariat	Using Climate Resilient Altitudinal Gradients (CRAGs)[2] to plan interventions in mountainous transboundary watersheds	CRAGs are multiscale landscape units with a minimum altitudinal range of 1,000 metres, characterized by climate resilient biodiversity and ecosystem service values. With the participation of key stakeholders and transboundary lake basin authorities, CRAGs are being used to create a spatially explicit plan of action for nine terrestrial and four freshwater key biodiversity areas at various altitudes		✓	
BlueVenturesE42	Blue Ventures	Periodic fishing system	After first determining the necessary recovery period of a subsistence fishery, the fishing cycle is changed to a system of carefully balanced fishing and non-fishing periods. The implementation of this system has helped the Vezo people of		✓	

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[1] <http://www.birdlife.org/worldwide/science/assessing-ecosystem-services-tessa>.

[2] <http://www.birdlife.org/sites/default/files/attachments/CRAG-project_0.pdf>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			southern Madagascar to improve both conservational outcomes and fish yields			
AERIE46	Amazon Environmental Research Institute	System of Observation and Monitoring of Indigenous Amazon (SOMAI) platform[3]	Through the use of historical data on climate anomalies and regional deforestation, SOMAI web-based platform provides a database capable of generating indicators for the indigenous people's land exposure to extreme climate events. The platform supports a consultation and monitoring system	✓	✓	
BrazilE07	Brazil	Dissemination of agroecological practices and techniques through the Mandacaru Capacity Building Center	The centre disseminates a wide range of agroecological practices and techniques and manages a school that not only educates children but promotes the participation of their parents in enhancing their understanding of these practices through meetings and activities. The development of social capital around the school has helped to build community trust in adopting new practices		✓	
CanadaE03	Canada	No-tillage agricultural technologies and systems	No-till farming reduces the impacts of climate change and helps to build soil carbon and quality, improve nutrient balance and improve water conservation while reducing the need to disturb the soil. A study in Alberta found that the method was one of the few strategies farmers were able to implement to adapt to climate change. A database of farmers, equipment, and soil and crop types was developed so that new farmers could contact someone with the same agricultural circumstances for focused learning by experience		✓	
CanadaE03	Canada	Inclusion of no-tillage questions in the Canadian national census	The inclusion of questions in the Canadian national census regarding uptake of no-till agriculture allowed the Government of Canada to measure progress in the utilization and uptake of no-till agricultural practices		✓	✓
CAREE26	CARE International	Participatory Monitoring, Evaluation, and	The PMERL manual helps practitioners to measure, monitor and evaluate changes in local adaptive capacity for better decision-making in community-based adaptation activities. The approach		✓	✓

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[3] <http://ipam.org.br/ipam/folheto-somai-en>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
		Reflection and Learning (PMERL)[4] tool	provides an ongoing platform for local stakeholders to articulate their own needs and preferences beyond the lifetime of a project. During regular review and reflection meetings with communities, the PMERL tool was utilized to enable the discussion of progress on the achievements of the project in a participatory way before any changes required in the adaptation plan were made			
CFIE44	Community Forests International	Community-based Risk Screening Tools – Adaptation and Livelihoods (CRiSTAL) tool[5]	The CRiSTAL project-planning tool was used to conduct participatory risk and asset mapping for target communities. In Pemba, the process allowed further refinement of project activities in the form of scalable resilience adaptation toolkits – unique assemblages of appropriate technology activities tailored to each target community	✓		
CFIE44	Community Forests International	Custom top-down monitoring and evaluation (M&E) framework	The custom top-down M&E framework includes purpose-built software tools stratified into three separate but continuous levels of operation: (1) real-time data collection by project officers using an in-house FieldView project monitoring application based on FileMaker and GPS-enabled tablet technology; (2) data archiving, data set compilation and open source data sharing via a custom online Adaptation Database; and (3) evaluation of project impacts and identification of opportunities for refinement based on regular benchmarked internal reviews and third-party Results Oriented Monitoring			✓
ICIMODE39	International Centre for Integrated Mountain Development	Participatory Perspective Land use Planning approach	A Participatory Perspective Land use Planning approach, including facilitated community mapping and meetings, was used in North-east India to promote the practice of land zonation, contributing to improved resource management and conservation of ecosystem services and livelihood security		✓	
ILOE06	International Labour	Innovative and integrated financial	The model bundles and rolls out critical financial and non-financial services in an integrated financial package (IFP) to		✓	

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[4] <http://careclimatechange.org/tool-kits/pmerl>.

[5] <https://www.iisd.org/cristaltool>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
	Organization	and risk transfer mechanisms	farmers who are more vulnerable to climate-related risks by their poverty and lack of access to financial and productive resources. The approach facilitated increased access to credit, savings facilities, and formal and informal insurance (crop, life, health), including the innovative Weather-Index-based Insurance Package. It further facilitated access to productive services, including agritechnology training (Farmer Fields School) and related agriculture support, enterprise and business training as well as market information and assistance. These services are delivered through the three models of the IFP: the Rural Bank model, the Cooperative model and the Local Government Unit Loan Facility model			
ILOE25; ILOE45	International Labour Organization	Local resource-based approaches	Local resource-based approaches combine and optimize the use of local resources in the construction and maintenance of infrastructure and environmental works. The approach helps to generate employment in the short term and trigger a multiplier effect on the cash injected into local communities, supporting the local economy. Other benefits include capacity-building through training and local partnerships		✓	
IUCNE14	International Union for Conservation of Nature (IUCN)	Community Environment Conservations Fund (CECF) tool[6]	The CECF tool acts as an enabling environment for communities to access microcredit and undertake activities that will improve their livelihoods in the short term while restoring and enhancing sustainable management of their water and natural resources in the long term. The CECF tool allows communities access to a USD 1,500 grant that simultaneously tackles poverty as a source of environmental degradation and spurs sustainable water resources and ecosystems management. To qualify for the funds, households must adhere and commit to guidelines for implementing the village natural resources micro-catchment plan that has been mutually developed and agreed to		✓	

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[6] <http://www.uwasnet.org/Elgg/best_practice/view/6128/community-environment-conservation-fund-cecf-as-a-tool-to-catalyze-water-resources-management>; <http://cmsdata.iucn.org/downloads/cecf_guidelines_final_1.pdf>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
IUCNE15	IUCN	Community-based Ecological Mangrove Restoration (CBEMR) method	The CBEMR method uses hydrological restoration to revive degraded areas. In this case study, the method allowed shrimp ponds to be returned to functioning, productive ecosystems that act as bioshields, increasing the resilience of vulnerable coastal communities. The communities are taught how to restore and sustain the underlying hydrology of former mangrove sites, boosting their biodiversity		✓	
IUCNE15; IUCNE38; IUCNE47	IUCN	Action Learning approach[7]	The Action Learning approach is used in several IUCN projects to monitor and evaluate the project activities. Through a series of repeated cycles of action, observation, reflection, learning and planning, this process allows for learning from action, with insights and understanding that informs further action in a cyclical manner		✓	✓
IUCNE23	IUCN	Forest Landscape Restoration (FLR) strategy	The FLR strategy involves the following steps: (1) Define the FLR strategy: defining and adopting a strategy to align stakeholders in the restoration initiatives (governmental institutions, communities and private companies), while allowing the creation of an official road map for each country. This strategy is accompanied by a biophysical and economic evaluation in each country through the use of the Rapid Restoration Diagnostic and Restoration Opportunities Assessment Methodology (ROAM). (2) Identify pilot restoration areas: identifying the needs and opportunities of FLR actions in both communities and anchor companies (mining, hydropower, tourism, etc.) interested in improving the ecological integrity within a landscape gradient. (3) Monitor the extent of successful initiatives: monitoring is performed in terms of return on investment, social and natural capital, and capital of inspiration		✓	✓
IUCNE23	IUCN	FLR strategy combined with ROAM[8]	ROAM is a flexible and affordable framework for countries to rapidly identify and analyse FLR potential and locate specific areas of opportunity at national or subnational levels. These	✓		

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[7] <https://portals.iucn.org/library/sites/library/files/documents/2014-038.pdf#page=108>; <www.sdfthai.org> (in Thai).

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			assessments help to highlight both the economic and the ecological opportunities that assisted and passive restoration can bring. The methodology is used in conjunction with the FLR strategy described above			
IUCNE33	IUCN	Narrative approach to better understanding, assessment and planning[9]	This narrative approach started with IUCN analysing climate hazards based on villagers' 'community climate story', analysing those hazards that historically affect the village, the ways in which crops and livelihoods are affected at different times of the year, and the strategies already in place to deal with these hazards. The project then presented the 'scientific climate story' on the findings of a Mekong-oriented study, a local vulnerability assessment, and both climate and non-climate factors that increase that community's vulnerability. Local communities then defined a community vision based on shared understanding of the two stories, which enabled them to identify short-, medium- and long-term activities to increase both community and ecosystem resilience	✓	✓	
IUCNE35	IUCN	Use of micro watersheds as the main units for zoning and planning[10]	By applying the ecosystem and sustainable livelihoods approach, IUCN developed a model of community planning and water management with an emphasis on micro watersheds based on broad community participation and recognition of micro watersheds as the main land units for zoning and planning. The model was developed with the active involvement of local political authorities with responsibilities for environmental issues. An approach using watersheds as units of territorial planning, especially for integrated water resources management, helps to address, discuss, link and better understand cause and effect	✓	✓	

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[8] <http://careclimatechange.org/tool-kits/pmerl>.

[9] <http://iucn.org/about/union/secretariat/offices/asia/asia_where_work/thailand/our_projects/usaid_mekong_arcc_thailand>.

[10] <https://portals.iucn.org/library/efiles/documents/2009-095.pdf> (in Spanish).

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
IUCNE47	IUCN	Community Vulnerability and Capacity Assessment tool	This tool was used by communities to identify the main threats they are facing because of climate change, as well as local adaptation strategies put in place to cope with those threats. The aim was to identify, reintroduce and scale up successful local adaptation strategies	✓	✓	
IUCNE05	IUCN	Climate Resilience Evaluation for Adaptation Through Empowerment (CREATE) tool[11]	CREATE provides a broad, flexible framework together with general guidelines and suggestions, allowing people to assess and analyse their vulnerability and capacity, identify adaptation options and begin the planning process. It is a step-by-step process that demystifies the adaptation assessment and planning process, making terms accessible, analysable and assessable. CREATE raises awareness, increases knowledge and develops capacity within the local groups, organizations and networks that represent the community and vulnerable groups	✓	✓	
KenyaE40	Kenya	Payment for Environmental Services (PES)	PES was used in Kenya as a viable financial mechanism for the payment for watershed services to deliver sustainable natural resource management. The scheme applies a voucher system, with vouchers redeemable with agro-inputs at convenient and agreed-upon outlets. Benefits include increased farm productivity, increased income from different green businesses, qualitatively observed increase in water clarity, improved food security, and community acquired skills and knowledge on good land management practices to protect ecosystems		✓	
Nestlé E12	Nestlé	Agroforestry and reforestation to increase resilience of cash crops[12]	The methodology focused on appropriate planting models and tree species for the regions to improve ecological and growing conditions and increase resilience against geophysical and biological threats to crops	✓	✓	

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[11] <https://cmsdata.iucn.org/downloads/create_factsheet_final.pdf>.

[12] <http://www.nestle-nespresso.com/asset-libraries/Related%20documents%20not%20indexed/Nespresso%20Project%20Background%20-%20Agro-forestry%20Program.pdf>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
PracticalActionE31	Practical Action	Livelihood-Centred Disaster Risk Reduction[13]	Livelihoods are strengthened and diversified to reverse the gradual erosion of capital and security that intensifies in the face of recurrent 'small-scale' disasters. Stakeholders are engaged through participatory baseline development and the creation and training of disaster management committees at ward, district and provincial levels	✓	✓	✓
RareE49	Rare	Implementation of Territorial Use Rights for Fisheries coupled with marine reserves (TURF-Reserve)[14]	By combining TURF with marine reserves, Rare increases the capacity of local communities and fishers to manage access to near shore fisheries as well as conserve critical coastal habitat through marine protected areas. This model allows for the protection of key habitats where fish stocks can rebuild and generates a spill over effect that leads to improved catch in the adjacent fishing zones. Additionally, because of the value of assigned fishing rights within the TURF-Reserve, this system provides strong incentives to protect the fish recovery zone and sustainably manage the fishery		✓	
SEIE52	Stockholm Environment Institute	Whole Decision-Network Analysis of Coastal Ecosystems (WD-NACE)[15]	WD-NACE provides primary decision makers at multiple levels of governance with a framework to aid understanding of the critical social and ecological elements of resource use and the complex interrelationship between them. The first step involves finding what information people are using to make their decisions – the state of the environment, financial situations and community standing. The second step involves 'coding' the behaviour of the actors through simulations. Lastly, the results were tested to see whether the framework could be used to investigate policies aimed at reducing poverty and managing ecosystems sustainably	✓	✓	
UNHabitatE32	United Nations Human Settlements	Scenario comparison study	In the scenario comparison study all the possible adaptation options for a particular region or community are determined and	✓	✓	

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[13] <http://practicalaction.org/livelihood-centred-approaches-to-disaster-management>.

[14] <http://fisherysolutionscenter.edf.org/catch-share-basics/turfs>.

[15] <https://weadapt.org/knowledge-base/adaptation-decision-making/whole-decision-network-analysis-for-coastal-ecosystems>.

Case study code	Organization or Party	Tools and methods	Description	Vulnerability and assessment	Planning and implementation	Monitoring and evaluation
	Programme		examined, from which a subset that can be fully costed is analysed to provide guidance on the best overall adaptation options. In Lami town, Fiji, scenarios ranging from pure ecosystem-based adaptation to pure engineering options to increase resilience were analysed before the benefits and costs (for every USD spent) of four different combinations were compared with taking no action based on a 20-year horizon			
UNEPE11	United Nations Environment Programme (UNEP)	Ecosystem-based adaptation (EBA) coastal decision-support framework[16]	A prototype EBA coastal decision-support tool to assist the two project countries, Grenada and Seychelles, in the selection, design, implementation and evaluation of options for coastal EBA	✓	✓	✓
USAE50	United States of America	Decision support tool[17]	Academic and government experts from multiple federal agencies brought together detailed information on historical and projected future flood risk (including from the National Oceanic and Atmospheric Administration and the Federal Emergency Management Agency) to create a decision support tool that enabled decision makers to interact with the available data, particularly those involved in updating New York's long-term sustainability plan and rebuilding efforts after Hurricane Sandy	✓	✓	
USAE24	United States of America	Climate Smart Conservation Program[18]	The programme aims to integrate climate change science, monitoring, adaptation, mitigation and communication into sanctuary management to achieve a healthy, resilient ocean for future generations. The sanctuary promotes nature-based solutions to sustain vibrant, diverse ecosystems, such as by reducing greenhouse gas emissions, enhancing coastal ecosystem carbon sinks, reducing climate change impacts on wildlife and people, and enhancing resilience		✓	✓
WMO/GWPE30	World Meteorological	Integrated Drought Management	The programme supports stakeholders at all levels by providing policy and management guidance and by sharing scientific	✓	✓	

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[16] <http://www.unep.org/climatechange/adaptation/Ecosystem-BasedAdaptation/EBADecisionSupportFramework/tabid/102163/Default.aspx>.

[17] <http://www.globalchange.gov/browse/sea-level-rise-tool-sandy-recovery>.

[18] <http://farallones.noaa.gov/manage/climate/climatesmart.html>; <http://sanctuaries.noaa.gov/management/climate/welcome.html>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
	Organization; Global Water Partnership	Programme tools and guidelines[19]	information, knowledge and best practices for integrated drought management. Under the programme, national drought management guidelines for the preparation of drought management plans within river basin management plans which are in accordance with the European Union water framework directive, a compendium of good practices and a drought information platform have been produced			
WWFE51	World Wide Fund for Nature	Top-down-meets-bottom-up approach climate vulnerability analysis for community-based climate change adaptation	The climate vulnerability analysis identifies priority interventions for community-based climate change interventions in the river basin and is based on projecting trends from historical climate data. In analysing the São João River basin in Brazil, the World Wide Fund for Nature's basin analysis was undertaken as a technical, top-down assessment, while the microbasin assessments involved bottom-up consultation with local communities to clarify likely risks and vulnerabilities	✓		
FS-UNEPE34	Frankfurt School – UNEP Collaborating Centre for Climate and Sustainable Energy Finance	Promotion and support of specific microfinance products and services to fund EBA[20]	The method assists in the development and implementation of new financial products and services tailored to rural populations vulnerable to the effects of climate change, provides customized capacity-building to microfinance institutions (MFI), and helps raise awareness and build capacity in MFI clients. In rural and periurban communities in Peru and Colombia to date, 2,300 disbursements targeting EBA investments have been realized by three partner MFIs, providing loans targeting EBA options		✓	

Table 7

Tools and methods referred to in the case studies addressing human settlements

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[19] <http://www.droughtmanagement.info/find/guidelines-tools>.

[20] <http://fs-unep-centre.org/projects/microfinance-ecosystem-based-adaptation-climate-change>; <http://www.pnuma.org/meba>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
EEAHS08	European Environment Agency	Climate Atlas	The Climate Atlas provides standardized climate assessments for the 179 towns and municipalities in the Stuttgart region. The Atlas comprises maps that show regional wind patterns, flows of cold air, air pollution concentrations and other relevant information required to inform planners on what to do for urban climate optimization, which could inform new projects and retrofits. A key element is an area classification of the role that different locations play in air exchange and cool airflow in the Stuttgart region based on topography, development density and character, and provision of green space. The Atlas distinguishes eight categories of area in this manner, and different planning measures and recommendations are provided for each of them	✓		
ILOHS01	International Labour Organization	Learner-centred and participatory training approach	In this approach, modern, interactive adult learning methods are combined with training and knowledge-sharing elements. Throughout the training, emphasis is placed on partnerships at the local level and the effective use of local resources, with special attention given to regional and local experiences. The approach helped to increase local level capacity in both the public and the private sectors to integrate employment and livelihood concerns in local development strategies, programmes and business activities within the context of climate change adaptation, disaster risk reduction and crisis response		✓	
IUCNHS03; IUCNHS04; IUCNHS05; IUCNHS17; IUCNHS18; IUCNHS26	International Union for Conservation of Nature (IUCN)	Method of Evaluation by Group Facilitation	The Method of Evaluation by Group Facilitation involves community members in the development of common knowledge and the production of solutions. The technique includes activities such as participative mapping, 'kitchen assemblies' and focus groups to co-construct knowledge. It includes five steps: (1) collecting statements or opinions from participants; (2) developing a common understanding of these statements; (3) sorting the statements into groups of common themes; (4) prioritizing the statement groups; and (5) debating the results and evaluating the process. The method is often used in combination with the community resilience capacity-building tool outlined	✓		

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			below. The results of the combination of these two components have included a greater understanding of climate change adaptation at the community level, the development of an adaptation plan that can be realistically achieved by the community, and a greater sense of ownership and engagement of the community in the climate change adaptation process			
IUCNHS03; IUCNHS04; IUCNHS05; IUCNHS17; IUCNHS18; IUCNHS26	IUCN	Community resilience capacity-building tool	Developed in order to help communities to initiate the process of adapting to climate change, the community resilience capacity-building tool helps communities to initiate the process of adapting to climate change. The tool itself provides a step-by-step explanation of the adaptation option with three sections: section 1 explains the process, section 2 describes how to assess risks and vulnerabilities looking at various aspects of social-ecological systems, and section 3 examines the way people can define solutions and strategies as well as how these solutions can be prioritized. The process itself is composed of 11 steps, which can be performed at a workshop over a few days or, most likely, given the limited availability of communities for a large block of time, through a series of meetings completed over a certain period of time. The tool is often used in combination with the Method of Evaluation by Group Facilitation described above. The results of the combination of these two components have included a greater understanding of climate change adaptation at the community level, the development of an adaptation plan that can be realistically achieved by the community, and a greater sense of ownership and engagement of the community in the climate change adaptation process	✓	✓	
KoreaHS07	Republic of Korea	Vulnerability Assessment Tool to Build Climate Change Adaptation Plan (VESTAP)	The VESTAP platform includes the impact database and climate change variability assessment tool. Climate change impacts in this platform were classified according to the classification mechanics designed by the Intergovernmental Panel on Climate Change. Under these mechanics, units can be expanded to rural	✓		

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			and metropolitan areas. The assessment results provide useful information that can also be used as spatial-temporal geographic information. The VESTAP results of all counties and communities in the Republic of Korea were visualized on the Internet browser platform, and these results will contribute to establishing a climate change adaptation master plan for central or community level local governments in 2015			
KoreaHS09	Republic of Korea	Climate Change Risk Assessment Tool (CCRAT) for the business sector	CCRAT has been developed to estimate the financial implications of the impacts of climate change on businesses in the Republic of Korea, using the financial statement and the balance sheet of each business. CCRAT is composed of a checklist for climate risk assessment, a semi-quantified risk assessment of climate change and suggested guidelines for adaptation. (1) The checklist for climate risk assessment evaluates how ready a business is for the risks climate change poses. Users can select a type of climate change risk and gauge its potential magnitude and probability. (2) The semi-quantified risk assessment uses Microsoft Excel software. The basic database includes prior probability distribution and climate risk probability: one shows how frequently damage that can be observed in the society occurs, while one is based on the regional climate projection database provided by the Korea Meteorological Administration. (3) The suggested guidelines for adaptation in the business sector present a method to develop an adaptation strategy and action plan based on the CCRAT results	✓	✓	
NetherlandsHS28	Netherlands	Cyclic adaptive planning and decision-making pathways	The Delta Programme introduced cyclic adaptive planning (a step-by-step approach) and decision-making pathways in order to deal with climatological and socioeconomic uncertainties about the future. In this way, adaptive water management reduces the risk of unforeseen climate adaptation costs at a later stage as a result of inaction as well as the risk of investments in, for example, water infrastructure that later turned out not to be necessary (over investments). Adaptive water management is	✓	✓	

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			therefore a bridge between the 'no regret' principle and the 'precautionary principle' and provides flexibility for decision makers in water management and spatial planning			
NorwayHS02	Norway	The Climate Helper[21]	To help bridge the gap between scientific understanding and municipal needs, the *Klimahjelperen* (The Climate Helper) was developed. The Climate Helper focuses on how municipalities can include climate adaptation in their daily tasks and the climate profile gives a short summary of knowledge on a region's climate challenges, expected changes and available information and data		✓	
StudioNavaraHS21	StudioNavarra; GEOHAUS	German real estate valuation database	This database includes information on existing real estate purchasing prices, standard ground values and residential tables. Purchasing price data is based on data provided from the copies of each contract, leases and experts committees	✓	✓	
UNHabitatHS15	United Nations Human Settlements Programme	Gender-adapted 'exploratory walk' methodology	The Kampala Capital City Authority adapted the 'exploratory walk' methodology as advocated by United Nations Human Settlements Programme in a gender-sensitive area. Exploratory walks include: selecting suitable neighbourhoods; recruiting eight-member local groups (women only, men only and mixed sex groups); briefing the groups before separate sex and mixed sex group discussions; taking an exploratory walk to validate the findings; and discussing practical findings as separate sex then mixed sex groups. The exercise ends with a consensus-building session focusing on priorities for climate change adaptation. Gender-disaggregated data provided insights into respective interests and potential policy responses from the municipality. In Kampala for example, the walks resulted in women and men increasing their knowledge about urban gender dynamics in climate change. Men in particular came to appreciate that women's comparatively lower socioeconomic status made them more vulnerable to the effects of climate change and constrained	✓	✓	

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[21] <http://www.dsb.no/no/toppmeny/Publikasjoner/2015/Tema/Klimahjelperen> (in Norwegian).

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			their capacity to cope			
UNHabitatHS27	United Nations Human Settlements Programme (UN-Habitat)	Economic diversification training strategy	To help build community resilience to external shocks in communities vulnerable to climate change in Senegal, UN-Habitat project partners established a small industrial facility at the project site and provided hands-on training to about 100 residents on producing prefabricated housing modules that had been carefully adapted to the local context. Artisans who learned new skills now have an additional or supplemental source of income on which to fall back. The project thus went beyond reducing exposure to the climate change impacts causing the residents' vulnerability, such as storm surges and sea level rise – it tackled some of the more fundamental root causes of vulnerability	✓	✓	
WFEOHS30; WFEOHS31	World Federation of Engineering Organizations	Public Infrastructure Engineering Vulnerability Committee (PIEVC) Engineering Protocol[22]	The PIEVC Engineering Protocol is designed to assess the climate risk and engineering vulnerability of civil infrastructure (including buildings) to the impacts of climate change. The protocol systematically reviews historical climate information and projects the nature, severity and probability of future climate changes and events with the adaptive capacity of an individual infrastructure as determined by its design, operation and maintenance. It enables the identification of components at higher risk and the nature of the threat from the climate change impact. This information can be used to make informed decisions on what components require adaptation as well as how to adapt them; for example, design adjustments, or changes to operational or maintenance procedures	✓		

Table 8

Tools and methods and tools referred to in the case studies addressing health

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[22] <http://www.pievc.ca>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
EEAH04	European Environment Agency	Heat-health warning system (ALERT system for heatwaves) tool	The ALERT system for heatwaves tool promptly informs all the participants in the system of upcoming heatwaves so that they may implement the foreseen measures and activities immediately. This system uses the weather forecast to predict situations which could lead to an increase in mortality and morbidity as a consequence of heatwaves. It includes a responsible body, a 24–48 hour heat early warning, specific thresholds for action, and priorities for vulnerable populations, workers' health and communication		✓	
WHO/UNDPH05; WHO/UNDPH06; WHO/UNDPH07; WHO/UNDPH08; WHO/UNDPH09; WHO/UNDPH15	World Health Organization (WHO); United Nations Development Programme	Climate change adaptation to protect human health methodology	The WHO methodology aims to increase the adaptive capacity of national health system institutions, including field practitioners, to respond to climate-sensitive health risks. Under this methodology, the main health-related vulnerabilities to climate variability and change for the country are defined (e.g. diseases associated with water scarcity, storms and floods, changing climatic patterns, malnutrition) before the country's current health policies are examined to determine how the country is already addressing the challenges. Then, strategies, policies and measures are identified to determine how to address these incremental risks posed by climate change. Following this process, the barriers to implementation of these strategies, policies and measures are defined, along with the incremental costs necessary. Based on this information, a proposal is designed to implement one or more of these actions in each country	✓	✓	
UNITARH11	United Nations Institute for Training and Research	Resource guide for advanced learning on understanding the climate change and health interface[23]	The resource guide provides access to key high-quality learning resources on climate change and health. It is designed to facilitate access to state-of-the-art materials and courses on climate change and health, drawn primarily from within the United Nations system. Written from the perspective of a learner, it considers the following topics: (1) health impacts of climate change; (2) health-related vulnerability and adaptation assessments; (3) early warning systems for health risks; (4) building resilience of the		✓	✓

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[23] <http://www.uncclearn.org/sites/default/files/images/resource_guide_on_understanding_the_cc_and_health_interface.pdf>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			health system; (5) national strategies and action plans on health adaptation to climate change; (6) monitoring and evaluation of programmes on health adaptation to climate change; (7) engagement with other health-determining sectors; and (8) health co-benefits of mitigation and adaptation policies and programmes			
USAH02	United States of America	Building Resilience Against Climate Effects (BRACE) framework[24]	The BRACE framework allows health officials to develop strategies and programmes to help communities to prepare for the health effects of climate change. Part of this effort involves incorporating complex atmospheric data and both short and long range climate projections into public health planning and response activities. Combining atmospheric data and projections with epidemiologic analysis allows health officials to more effectively anticipate, prepare for and respond to a range of climate sensitive health impacts. Five sequential steps comprise the BRACE framework: (1) anticipate climate impacts and assess vulnerabilities; (2) project the disease burden; (3) assess public health interventions; (4) develop and implement a climate and health adaptation plan; and (5) evaluate impact and improve the quality of activities		✓	✓
WHOH03	WHO	Health-National Adaptation Plan (H-NAP) guidance	The H-NAPs of WHO provide guidance on protecting health from climate change through health adaptation planning. An addition to the technical guidelines for the NAP process[25] on needs and specificities for the health sector, it has the same components and similar steps as the ones recommended for the overall NAP process. (1) Lay the groundwork: align the health adaptation planning process with the national process for developing a NAP and take stock of available information. (2) Prepare: conduct a health vulnerability and adaptation assessment, review implications of climate change on health-related development goals, legislation, strategies, policies and plans, and develop a national health adaptation strategy that identifies priority options. (3) Implement strategies: develop an	✓	✓	✓

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[24] <http://www.cdc.gov/climateandhealth/brace.htm>.

[25] <http://unfccc.int/7279.php>.

Case study code	Organization or Party	Tools and methods	Description	Vulnerability and assessment	Planning and implementation	Monitoring and evaluation
			implementation strategy for operationalizing H-NAPs and integrating climate change adaptation into health-related planning processes at all levels, and promote coordination and synergy with the NAP process, particularly with sectors that can affect health, and with multilateral environmental agreements. (4) Report, monitor and review: monitor and review the H-NAP, update the health components of the NAPs in an iterative manner, and perform outreach for the H-NAP process			
WHOH10	WHO	Protecting health from climate change: vulnerability and adaptation (V&A) assessment	The V&A assessment is a flexible tool which can be applied depending on the users' climate-related outcomes of concern. It can be completed using qualitative methods (e.g. creating health storylines), quantitative methods (e.g. the Pan-American Health Organization Hospital Safety Index to evaluate the resilience of health services to extreme events and emergencies) or a combination of the two. The basic steps include identifying the frame and scope of the assessment; conducting vulnerability, impact and adaptation option assessments; and managing and monitoring the health risks of climate change	✓		✓

Table 9

Tools and methods and tools referred to in the case studies addressing water resources

Case study code	Organization or Party	Tools and methods	Description	Vulnerability and assessment	Planning and implementation	Monitoring and evaluation
AGWAW05	Alliance for Global Water Adaptation (AGWA)	AGWA Decision Support System (DSS)[26]	The DSS is a series of guidance documents designed as a tool to integrate existing and emerging insights about climate adaptation and water resources management into an evidence-based system to inform water management decision-making processes. It	✓	✓	✓

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[26] <http://alliance4water.org/About/DSS/index.html>; <http://agwaguide.org>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			focuses on four components: (1) bottom-up approaches to vulnerability assessment that reflect inherent system limits and serve as an effective means of framing uncertainties about future climate projections; (2) creating explicitly flexible decision pathways that use economic analytical methodologies to estimate the costs of maintaining multiple options and evaluate trade-offs between waiting for more certain information before implementation versus acting in the short term with less information; (3) integrating approaches to resilience from both engineering (hard infrastructure) and ecological (dynamic social-ecological systems) perspectives; and (4) developing governance systems that reallocate, learn and anticipate shifting needs and conditions			
NSESCW26	National Socio-Environmental Synthesis Center	Eco-Engineering Decision Scaling (EEDS)[27]	EEDS is a framework that incorporates socially valued ecological processes into water infrastructure design with the aim of providing a robust foundation for advancing sustainable water management. EEDS specifically quantifies engineering-ecological trade-offs. It is an expansion of the decision scaling approach, a risk assessment framework for water resources management specifically designed to guide decision-making under the uncertainty of future hydrological conditions	✓		
MetOFFICEW10	Met Office Hadley Centre for Climate Change	Microfinance[28]	As part of a series of interventions aimed at minimizing the impacts of climate change in the Pyanj River basin, Tajikistan, microfinance was used to expand the capacity of relevant institutions in the Pyanj River basin to provide microdeposits and microloans for climate resilient economic activities, strengthening the financial literacy of the local population and assessing the feasibility of a credit insurance scheme		✓	
IGESW02	Institute for Global Environmental	Gender-sensitive focus group	As part of a project to prioritize adaptation effectiveness indicators in Bangladesh, Nepal and India, FGDs were used to	✓	✓	

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[27] <http://agwaguide.org/EEDS/index.html#welcome>.

[28] <http://www.ppcr.tj>.

Case study code	Organization or Party	Tools and methods	Description	Vulnerability and assessment	Planning and implementation	Monitoring and evaluation
	Strategies	discussions (FGDs)[29]	allow local community members to identify adaptation indicators, criteria and practices on their own. Discussions were conducted in gender groups as the women in the target communities tend to support male counterparts in a public process and it is often difficult to bring out the women's priorities and preferences. After having the process and relevant climate change concepts explained to them, participants listed past climate-related events and their impacts, and practices that have helped them or they thought would have helped them to alleviate the impacts of these events. Participants grouped and ranked indicators, criteria and practices and constructed a decision hierarchy tree. The data were analysed to obtain priority scores for indicators, criteria and practices and their combinations			
MonsantoW06	Monsanto	AquaTEK™ [30]	AquaTEK is an irrigation efficiency programme addressing water scarcity through a systems approach to water management. The programme is a private–public collaboration bringing together key components of farm management: water management, improved seed genetics, irrigation system options, and training and education. A blog and a website have been developed to accompany the programme. Assessment carried out by the Monsanto Technology Development Team indicates the programme increases crop yield by 12 per cent, while reducing irrigation water use by 30 per cent, fuel use by 80 per cent and nutrient run-off by 70 per cent, versus drum irrigation systems		✓	
NetherlandsW14	Netherlands	Freshmaker	Freshmaker (developed by KWR-Water_research) is based on aquifer storage and recovery, which involves injection and recovery of fresh groundwater in aquifers via vertical abstraction wells		✓	

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[29] <http://pub.iges.or.jp/modules/envirolib/view.php?docid=4969>; <http://pub.iges.or.jp/modules/envirolib/view.php?docid=4550>.

[30] <www.aqua-blog.com> (in Italian); <http://www.monsanto.com/improvingagriculture/pages/aquatek.aspx>; <http://aqua-blog.com/category/aquatek> (in Italian); <http://monsantoblog.com/2014/03/06/italian-farmer-praises-aquatek-project>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
NetherlandsW14	Netherlands	Drains2buffer[31]	Drains2buffer involves fresh groundwater storage in shallow rainwater lenses with controlled drainage. The rainwater storage capacity of the subsurface is increased by drainage of brackish to saline groundwater. This is achieved by placing drainage pipes deeper and closer to each other compared with conventional drainage designs		✓	
OCW34	Ouranos Consortium	Participative approach to the identification and development of adaptation options	A participative approach to the identification and development of adaptation options is used as part of a multidisciplinary and integrated approach to developing adaptation strategies. The process of the participative approach was designed to facilitate the transfer of multiple types and sources of information (socioeconomic, environmental, technical and scientific) to policy advisors and decision makers. Following a workshop at the outset of the project to evaluate the vulnerability of coastal communities in eastern Québec to the impacts of climate change, user committees were formed to discuss, assess and choose adaptation solutions. This continuous transfer of knowledge and discussion with the project's scientific team led to the implementation of numerous adaptation actions and helped to increase the dynamic and holistic comprehension of the coastline, but more significantly it enabled discussions around the real issues of coastal management so that relevant and feasible adaptation options could be implemented	✓	✓	
OCW35	Ouranos Consortium	Freedom space for rivers[32]	This project explores the application of a hydrogeomorphological approach to the identification of potential flooding of the rivers in question in order to better understand how more frequent floods and periods of severe low water levels could pose a threat to public safety and alter the condition of river ecosystems. Using the hydrogeomorphological approach, the 'freedom space' of three rivers was determined by analysing historical photographs,	✓	✓	

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[31] <http://www.go-fresh.info> (in Dutch); <http://www.waterbuffer.net/english>.

[32] <http://www.ouranos.ca/media/publication/299_RapportBironetal2013.pdf> (in French).

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			digital elevation models and field observations. Numerical simulations were used to estimate the impact of climate change on the shift and potential flooding of the rivers, the floodplain and potential mobility areas of the rivers were mapped, and a cost–benefit analysis was conducted, based on a period of 50 years and a discount rate of 4 per cent. Stakeholders in issues relating to flooding were involved through an advisor committee			
PracticalActionW37	Practical Action	Peace Committees	Peace Committees are made up of leaders, agriculturalists, pastoralists, and men and women from tribes and villages that have been trained in conflict analysis, resolution, dialogue and evaluation. The ultimate aim is for these locally embedded and sustainable committees to facilitate the collaborative management of natural resources, specifically water and land, by pastoralist and sedentary farmers. The Peace Committee holds weekly or biweekly meetings and monitors community relations in regard to natural resource use. As a result, the Peace Committee helps to defuse conflict and maintain the adaptive capacity of concerned communities	✓	✓	✓
RareW22	Rare	Pride for Reciprocal Water Agreements (ARA)	Through Rare's ARA approach, landowners, water users and local authorities work together to achieve climate compatible development outcomes through a long-term, reciprocal agreement and a permanent financial mechanism. ARA combines Rare's social marketing and behaviour change campaigns with reciprocal water agreements, offering local communities an effective and scalable approach to safeguard cloud forests, protect endemic ecosystems and species, and preserve clean water for thousands of people downstream. The approach consists of four steps: (1) downstream water users pay into a fund, often through their water bill, that finances incentives for upstream landowners to conserve land; (2) landowners receive incentives to conserve watershed habitat; (3) communities take pride in their effort to conserve forests and grasslands that provide water and harbour endangered species; and (4) people and nature benefit from a cleaner and more		✓	

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			reliable water supply			
UNECEW13	United Nations Economic Commission for Europe (UNECE) (Convention on the Protection and Use of Transboundary Watercourses and) International Lakes); Organization for Security and Co-operation in Europe; United States Army Corps of Engineers; United States Army Engineer Institute for Water Resources; Alliance for Global Water Adaptation	AGWA methodology[33]	This tool is a bottom-up approach to water resources planning under climate change. First, system thresholds are identified, such as hydrological breaking points for flood risk or for energy, agriculture, water supply or ecosystem sectors. With this information, various climate scenarios are run through a system model to determine the type of hydrological event that would cause the system to pass a threshold for a given sector. Then, adaptation options, including management, governance and structural options, are considered to build robustness against climate change into the system. Finally, three factors are considered before the final decision on an option is made: (1) the investment required for the adaptation option; (2) the confidence in the available climate information; and (3) the consequences if the adaptation option is not implemented	✓	✓	
UNECEW13	UNECE (Convention on the Protection and Use of Transboundary Watercourses and International Lakes); Organization for Security and Co-operation in Europe; United States Army Corps of Engineers;	Multi-Reservoir Model for the Dniester River Basin	This model was developed by the United States Army Engineer Institute for Water Resources to provide basin stakeholders a means by which to transparently evaluate alternative water management strategies – part of an effort to develop a risk-informed decision framework for water resources adaptation to climate change. Stakeholders and water managers from both Ukraine and the Republic of Moldova are able to use the knowledge provided by this model to collaboratively develop a water management plan for the Dniester River basin that accounts for energy, environmental, agricultural, municipal water supply and flood risk management needs	✓	✓	

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[33] <http://agwaguide.org>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
	United States Army Engineer Institute for Water Resources; Alliance for Global Water Adaptation					
USAW20	United States of America	National Integrated Drought Information System (NIDIS)[34]	The NIDIS Act prescribes an inter-agency approach for drought monitoring, forecasting and early warning. NIDIS is envisioned to be a dynamic and accessible drought risk information system that provides users with the capacity to determine the potential impacts of drought and the decision support tools needed to better prepare for and mitigate the effects of drought. Its main objective is to increase the number of States and institutions with improved capacity to inform risk management and reduce exposure to drought and flood risks. NIDIS works through a system of coordination that involves scientists working in physical, natural and social sciences, water resources professionals across scales of decisions and actions, and preparedness communities in regions across the United States. As a result of the programme, fire season professionals have improved information to prepare for real conditions, water managers have access to early warning information, water utilities managers are able to update plans for allocation and flood control, the fallow lands project helped to identify emerging food shortages in vulnerable communities, and improved monitoring has contributed to the efforts of tribal communities to improve conservation and land management		✓	
VeoliaW17	Veolia Environmental Services	STAR Utility Solution™[35]	In Copenhagen, the STAR Utility Solution was used with the aim of implementing an effective adaptation strategy capable of forecasting flooding via advanced control and warning systems. There are two main components to this strategy. The first is an		✓	

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[34] <http://www.drought.gov/media/imageserver/NIDIS/content/whatisnidis/NIDIS-IPFinal-June07.pdf>.

[35] <http://www.e-pages.dk/danskmiljoteknologi/37> (see page 68 for Copenhagen).

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			early warning system able to forecast floods six to twelve hours before they occur. Based on real-time control and on forecasting, the intelligent software continuously provides optimal operating conditions and maximizes the value of existing systems. Second, the software aims to optimize existing wastewater treatment plants and sewer network control systems by online control and overview of such plants and networks. As a result of the system, the number of all combined sewage overflows was reduced by 90 per cent, allowing a 93 per cent cost reduction compared with an investment in traditional storage capacity			
WMO/GWPW08	World Meteorological Organization; Global Water Partnership	HelpDesk on Integrated Flood Management (IFM)[36]	Stakeholders can directly access the World Meteorological Organization/Global Water Partnership Associated Programme on Flood Management (APFM) resources through its HelpDesk on IFM, a platform acting as a hub for information exchange on flood management, supported by the APFM Technical Support Unit and its network of Support Base partners		✓	
WWFW48	World Wide Fund for Nature	Better Cotton Initiative chain of custody process[37]	The Better Cotton Initiative has a chain of custody process to ensure that the cotton grown can be traced from field to shop, generating trust from buyers and enabling statistics to be collected on uptake of better production processes		✓	

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[36] <http://www.apfm.info/?page_id=1253>.

[37] <http://bettercotton.org>.

Table 10

Tools and methods referred to in the case studies addressing structures and processes linking national and local adaptation planning

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
IUCNL03	International Union for Conservation of Nature	Climate Change Gender Action Plan (ccGAP)[38]	The ccGAP identifies priority climate change concerns from a gender perspective and maps key actions at national and local levels. The plan focuses on key sectors, including, but not limited to, water, agriculture, health, mitigation (including energy and forests), disaster risk reduction and coastal management. The process is multi-stakeholder and multisectoral – often representing the first time technical staff of different ministries (e.g. water, energy, women's affairs) have a chance to build mutual capacity on key issues related to gender and climate change. The engagement of donors and a wide range of stakeholders is also key, especially women's organizations and networks both versed in and new to climate change, which offer on-the-ground realities and context to policymaking as well as innovative ideas for action, often building on already occurring projects. An outcome of the ccGAP process has been the identification of innovative activities through which women can be engaged proactively, empowered as partners and promoted as agents of change	✓		
KoreaL12	Republic of Korea	Guidebook to develop a project supporting people vulnerable to extreme weather	The guidebook: (1) defines and explains the group vulnerable to extreme weather; (2) introduces quantitative analysis methods, which are practical in formulating detailed action plans; (3) introduces actions local governments have taken for groups vulnerable to extreme weather, using quantitative analysis; and (4) provides feasible actions to support the group vulnerable to extreme weather in a practical way	✓	✓	
NepalL11	Nepal	Local Adaptation Plans for Action (LAPAs)	LAPAs are tools that use a set of processes to address the impacts of climate change and to enhance the resilience of communities vulnerable to climate change. LAPAs provide prioritized adaptation interventions planned by local communities for a three-year period. The key principle of LAPAs is to mainstream climate		✓	✓

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[38] <http://genderandenvironment.org/works/climate-change-gender-acton-plans-ccgaps>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			change adaptation into regular planning processes. The Nepal Climate Change Support Program does this through coinciding the planning process for LAPAs with the district level regular planning process			
CATIEL09	Tropical Agricultural Research and Higher Education Center	Methodology for the design of local strategies for climate change adaptation (ELACC)	ELACC is carried out with a participatory focus in three stages: (1) territory analysis: identifying the platform for participation (all local stakeholders), the work area, local livelihoods, resources and capital, and basic human needs; (2) vulnerability analysis: based on exposition, sensitivity and adaptive capacity; (3) designing the ELACC: based on the territory vision, strategic objectives with criteria for success and strategic lines of action	✓	✓	
UNESCWAL15	United Nations Economic and Social Commission for Western Asia	Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR)[39]	RICCAR has four pillars: (1) a baseline review; (2) an integrated assessment consisting of an impact assessment and a vulnerability assessment; (3) awareness raising and information dissemination; and (4) capacity-building and institutional strengthening. A vulnerability assessment methodology was developed and about 50 indicators for key sectors were identified, mainly for water, agriculture, biodiversity and ecosystems, infrastructure and human settlements, and people. This work included a review of more than 50 socioeconomic and environmental indicators that have been defined to characterize exposure, sensitivity and adaptive capacity related to these five sectors, as well as generation of selected maps to geospatially represent this information for the Arab region	✓		
SwedenL07	Sweden; United Nations Capital Development Fund	Performance-based climate resilient grants (PBCRGs)	The PBCRG approach facilitates the mainstreaming of climate change adaptation into local development plans, supporting the implementation of national level climate change and decentralization strategies. There is evidence that the approach strengthens the capacity of local authorities to identify, prioritize and co-finance climate change adaptation investments. PBCRGs include a set of minimum conditions, performance measure criteria and a menu of investments. Minimum conditions are concerned		✓	✓

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[39] <http://www.escwa.un.org/RICCAR/ri.asp?ReferenceNum=RI>.

Case study code	*Organization or Party*	*Tools and methods*	*Description*	*Vulnerability and assessment*	*Planning and implementation*	*Monitoring and evaluation*
			with public financial management and good governance. Each PBGRG provides an entry point for monitoring and evaluation and to inform future planning processes			
UNDPL05	United Nations Development Programme	Systematic disaster risk management planning process	The process began with a hazard, vulnerability and risk assessment in the project communities, followed by the preparation of a contingency/disaster management plan at the village level, which helped to identify the at-risk populations and assets in the village. The plan suggested measures to enhance disaster response capabilities and also recommended easy-to-implement, low-cost community-centric risk mitigation measures. Specific structural and/or non-structural mitigation measures were then implemented in the project villages, with community involvement		✓	

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